The
Electrical Review

VOL. CXXI DECEMBER 31, 1937. No. 3136

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY. Price 6d.

THE ELECTRICAL REVIEW, DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1.

Telegraphic Address: "AGEEKAY, SEDIST, LONDON." Code, A B C. Telephone No.: Waterloo 3333 (50 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW, LTD., and crossed "Lloyds Bank."

Classified Advertisements—Official Notices—Tenders—Supp. 15.

Index to Advertisers—Page xxxii.

Principal Contents:

	PAGE
The Avonmouth Docks	917
Dilution of Labour. By Charles John	920
Superheaters. By V. Walker	921
Transformer Tank Corrosion. By S. R. Mellonie and W. E. Nettleton	923
Developing the Cooker Load. By J. Allen	925
Protection Against Lightning. By N. V. Pestereff	926
Electrical Manufacturers' Activities	928
Correspondence: Motor-starting Regulations; A Three-phase Phenomenon; Hope Further Deferred	930
New Apparatus and Devices	931
New Books	933
The British Industries Fair, 1938	935
Business and Industrial Notes	936
Electricity Supply	940
Contract Information	943
Notes	944
Our Personal Column	945
Financial Section	946
Published Specifications	949
New Work for Contractors	950

Work in Progress

REMARKABLE as the activity among electrical manufacturers has been during 1937, the nature as well as the volume of orders in hand and plant under construction at the turn of the year give promise of a continuance of the present rate of production during the coming months. A particularly gratifying feature of the reports received is the large demand from abroad for British-made apparatus, especially in the heavier engineering sections, despite uncertainties in the international situation.

Starting from the generating end, the outstanding example of plant in the early stages of construction is the new 100,000-kW turbo-alternator for Battersea, with its 550,000 lb.-per-hour boiler. This extension is notable not only for the size of the units but also on account of the adoption of boiler steam conditions of 1,450 lb. per sq. in. and 965 deg. F. In this departure from existing power station practice, however, it is rivalled by the smaller set for Brimsdown A, where steam is to be produced at 1,900 lb. per sq. in. in forced-circulation boilers. Progress on these lines emphasises the importance of the research now being carried out into the effect on steels of elevated temperatures.

Another development to be recorded is the construction of turbo-alternators of 50,000 kW to run at 3,000 r.p.m. The proven reliability of generation at the higher voltages is indicated by the large number of alternators wound for 22 and 33 kV going through the shops.

An increasing proportion of distribution transformers is provided with on-load tap changing. The stipulations that certain transformers shall be impulse-tested and that non-inflammable oil shall be used for others provide two examples of conditions that seem likely to become less unusual in the future.

Probably the most significant aspect of reports on switchgear is that which relates to the large amount of work in hand for the reconstruction of existing breakers on both supply systems and industrial premises with a view to meeting more severe short-circuit conditions. Bus-zone protection is being extended, though cautiously; so is the use of spring reclosure in appropriate circumstances. Arc-suppression coils appear to be on the way towards starting a new vogue for overhead systems, and even for underground networks they have their advocates.

Apart from various extensions to the grid, the most striking achievement of cable-makers has been the production of cable employing gas as a preventive of ionisation, which is suitable for 200-kV working, bringing it close to the oil-filled type which is in operation at 220 kV.

With regard to industrial utilisation, the advances indicated in our Iron and Steel Numbers last April are being well maintained and there is a continuation of the demand in recent years for heavy plant, such as winders for mines in South Africa. We have noted from time to time the increasing use of discharge lamps in industry as well as in public lighting, especially since the advent of the smaller wattage units, while the newer fluorescent lamps offer fresh scope for the mercury-vapour type.

Conditions in the domestic field follow closely those discussed in our special issue in October. Meters and instruments present a wide field in themselves which merit the special treatment we propose affording them next week.

There is clearly much more in the present activity than production, as such, of electrical goods. Technical advances are being made that will, no doubt, considerably influence future prospects. Diversified as the electrical industry is shown to be by a mention of only a few outstanding examples of recent achievements, the interdependence of its various sections is equally obvious.

Research workers, designers and operating men are not only proving their readiness to meet the demand provided by the staff engaged in securing new load. By offering improvements in methods that reduce the cost of electricity and make more appliances available to the consumer they take their share in stimulating the demand and in extending still further the uses of electricity.

Much in a Word

WE have been taken to task for reporting last week that the Prime Minister hoped that the Electricity Bill would be passed during the current Session. Mr. DeRenzi, the hon. secretary of the Committee of Smaller Municipal Electricity Supply Undertakings, refers us to "Hansard" for December 16th, and we find, as he says, that Mr. Chamberlain is reported to have said that he was "hoping that it will be possible to introduce it in the current Session." We stand corrected, but must say that our Parliamentary reporter erred in good company. All the Press, headed by *The Times*, used the word "passed." Mr. DeRenzi's letter indicates that the hope of even introducing the Bill is receding, on account of the opposition which is being encountered in advance. In any event, Parliament has now adjourned until February 1st, and little will be done in the open until then. This delay and suspense are no good to the industry. There is inevitably a tendency on the part of supply authorities to hold up any but the most pressing developments until they know what is likely to happen to them as a result of any new legislation.

An Unusual Award

IN a recent claim for compensation for loss of employment under the Electricity (Supply) Acts the arbitrator took the unusual course of awarding the claimants an annual sum for life, as he was empowered to do. It is customary in such cases to award a lump sum calculated under regulations laid down by the Treasury. Apparently the amounts awarded have been based on the total service which the claimants would have had to their credit if they had gone on until retiring age. The rate of pension is probably lower, however, as they could reasonably expect the salaries upon which the amounts were calculated to rise in due course before their retirement. In commenting on the matter the *Electrical Power Engineer* says that there is no provision for any revision of such awards, even if the claimants subsequently secure other employment. Proposals which have been submitted to the Minister of Transport on behalf of employés in the electricity supply industry provide for payment of compensation in a lump sum or by periodical amounts. In the latter case it is suggested that the matter should be subject to review if the claimant is successful in obtaining other employment in the industry.

Irrelevance

IT has often enough been shown that the fixed charge in a domestic two-part tariff plus the cost of the kWh used for lighting at the low secondary rate is normally equivalent to the amount paid for lighting only when it is metered separately from power and heating. In an article in the *Gas Times* it is stated that electricity, in order to compete with gas at ordinary prices for space heating, must be supplied at ½d. per kWh without any fixed charge. The fixed charge has nothing to do with the case. It has to be met even if a consumer limits his use of electricity to lighting. He pays no more than ½d. per kWh for the additional energy that is used for heating.

Safety in Mines

A FRANK discussion of risks attached to the use of electricity, whether they be due to faulty design or workmanship, installation malpractices or misuse of apparatus, serves a valuable purpose if it is likely to lead to improvements. Such risks must, however, be considered in relation to the facts of industry as a whole, but no attempt to do so is made in a recent publication bearing the scare title, "Mining Disasters," the declared aim of which is to exclude electricity from the working face and its vicinity. Possibly its general tone is not unrelated to the decline during the past few years in the number of coal-cutters driven by compressed air as contrasted with a much greater rate of increase in the number of those electrically driven. Due perspective was, however, supplied by Mr. J. A. B. Horsley in his presidential address to the Association of Mining Electrical Engineers when he showed how very small is the percentage of accidents that can be attributed to electricity. The particulars which he then gave fully bore out the statement in his annual report as Electrical Inspector of Mines that notwithstanding the great increase in the use of electricity of late years, whether measured in h.p. installed, the number of coal-cutters in use, or the output got by electrical means, accidents due to electricity have not increased. Thus there would seem to be no necessity for reversion to compressed air on this account.

A Relay Experiment

WE recently reported the Government's intention to commence the institution of broadcast relay systems and in the House of Commons last week the Assistant Postmaster-General announced the first steps. Southampton has been chosen for an experimental system which will eventually cost £200,000. While part of the experiment will comprise the installation of a special wire network it is intended to make a limited experiment in the distribution of programmes *via* the telephone system. No mention was made of any scheme for using the electricity supply network which would reach a wider circle than the use of the telephone service. Perhaps it is intended to try this method elsewhere. While a national relay system will perhaps cheapen broadcasting reception for those who are content with a limited service, its effect upon the radio industry generally cannot be beneficial. Many radio concerns are guarding against adverse possibilities by entering the electrical appliance field which is likely to continue to expand.

Water Heating

THE next big effort of the British Electrical Development Association to stimulate domestic electrification will be devoted largely to water heating. There is no doubt an enormous scope for business in this direction and its development depends very largely on supply engineers. The cost of apparatus is as a rule quite reasonable and the equipment is eminently suited to hire and hire-purchase schemes. But the running cost is another matter. Unless a favourable tariff is offered the consumer will hold off. This is a load with great off-peak potentialities but the majority of undertakings have not yet introduced special off-peak charges to encourage it. We suppose that the control equipment is the principal handicap but there are means of control now available which should go some way towards overcoming the difficulty. Water heating salesmanship is receiving particular attention at the E.D.A. sales management conference at the end of next month.

Referred Back

IN our last week's issue we referred to proposals made by Mr. A. C. Johnson, the engineer and manager of the Southend Electricity Department, to extend the undertaking's trading activities. The Electricity Committee's report embodying these proposals came before the Council last week, but although the Department's case was ably presented, the result was that the report was referred back to the Committee. During the debate there were a number of interesting sidelights upon Southend's electrical affairs. For instance, it was stated that the local contractors were responsible for only 1.8 per cent. of the cooker applications this year, the Department's own staff having brought in the vast majority. Transactions with a vacuum cleaner concern were criticised, but were justified by the presenter of the proposals. One member of the Council said that it was a great mistake that the Commissioners' recommendations were not given effect to and that a joint development committee had not been appointed. The next move will be awaited with interest, for this, as we showed last week, is not merely a local question. It is but one manifestation of a widespread unrest.

The Avonmouth Docks

Important electrification scheme

A comprehensive grain-handling plant, banana conveyors and electric pumping are among the features of these docks

WHEN we visited the Avonmouth Docks recently, by the courtesy of Mr. W. P. Wordsworth, chief engineer to the Port of Bristol Authority, we were reminded in two ways of a public supply undertaking. The authority retails a large amount of energy to 48 tenants (sub-consumers) and it has a comprehensive scheme for electricity distribution, both for its own and its tenants' use, over the densely industrial docklands area. The rapid growth of industry at the docks is indicated by the increase in the total electricity consumption from 4.1 million kWh in 1929-30 to 26.6 million kWh in 1936-37.

Corresponding figures for the total consumption by the tenants are 2.5 million kWh and 22.5 million kWh, respectively. The Authority takes a.c. and d.c. bulk supplies from the Bristol Corporation electricity undertaking and last year the maximum demand was 7,400 kW.

The docks are situated at the junction of the Bristol Channel and the River Avon and consist broadly of two groups—Avonmouth Dock running approximately south-east to north-west and the more recently established Royal Edward Dock in a line roughly N.N.E.-S.S.W. A junction cut with a swing bridge connects the two groups, and while each dock has its own entrance channel and lock the major traffic for the whole system is *via* the entrance channel to the Royal Edward Dock. Near the Royal Edward Dock entrance lock there is a graving (dry) dock which will accommodate some of the world's largest vessels.

The Avonmouth Dock "hugs" the River Avon, and its surrounding quays, quaysheds and buildings are devoted almost entirely to the authorities' tenants. Some of these premises are magnificent modern flour and provender mills which are responsible for the greater part of the electricity consumption. A large section of this dock is devoted exclusively to bananas and we heard it said that the port is the largest one for banana traffic in this country. The dock also handles, in common with sections of its sister dock, such general cargoes as fruit, dairy produce, molasses, cocoa beans, timber and meat.

The Royal Edward Dock is divided into two arms, eastern, for the extension of which there is now a Bill before Parliament, and western. The quays and buildings around the western arm serve mostly for the handling of petrol and oils, and a very large area extending towards Chittening in the N.N.E. is occupied by tenants concerned with such products. From the strip of land separating the two arms the aerial ropeway which conveys phosphate rock to the nearby superphosphate works, which we recently described, and other minerals to the National Smelting Works is served by quayside cranes. Practically the whole of the S.E. and E. quays of the Royal Edward Dock are used for grain handling, and the system embraces extensive granaries which are owned by the Authority.

Generally the dockland development is towards Chittening where a couple of miles or so from the main dock entrance a large estate is the subject for the immediate attention of Mr. F. P. Phillips who is responsible to Mr. Wordsworth for the whole of the electrical system. Two 0.25-sq. in. 6.6-kV cables are to be laid underground to this estate from the Authority's main sub-station at a central point near the granaries.

The Distribution System

Both a.c. and d.c. supplies are taken from the St. Andrews Rd. distribution centre of the Bristol undertaking at 500/250 V d.c. and 6.6 kV a.c. At the Authority's main a.c. sub-station an Allen West e.h.p. switchboard has four incoming feeder units, a busbar coupler and nine outgoing feeder breakers. All the outgoing feeders are protected by direct acting trips with time-limit fuses, while the incoming feeder breakers are arranged for battery tripping. There are at the moment seventeen transformer sub-stations and one switch house served at 6.6 kV from this main switching station, and the tendency of development is towards the formation of e.h.p. ring mains.

A number of large consumers take supplies at 6.6 kV by means of feeders direct from the nearest sub-stations. Low-voltage supplies are given to other consumers by distributors from the sub-stations which also serve many of the consuming points in the Authority's own properties, the scheme being more or less comparable with that of a typical public supply street-cabling scheme. The l.v. supply is 365 V, 3-phase.

A granary showing interconnector conveyor galleries and roof cranes on adjacent sheds

The most remote sub-station at the moment is about a quarter of a mile from the end of the Royal Edward Dock, and its 3-phase connected group of single-phase transformers, e.h.p. truck-type switch and Ellison industrial-type l.v. pedestal circuit-breakers represents a layout typical of the whole scheme, although individual 3-phase transformers are installed in the more modern sub-stations. The a.c. and d.c. outputs are 25.6 million kWh and 1.0 million kWh per year, with maximum loads of 6,700 kW and 700 kW, respectively.

With a few notable exceptions all the cranes about the docks are d.c., as are many other equipments demanding wide speed variations. But the choice is also influenced by the fact that in the earlier days of the docks the electricity supply was obtained by private generation at d.c.

A good deal of the original distribution and consuming equipment installed in and around the docks is still in service and doing good work, particularly in the older parts of the granaries, and so there is no clear-cut division between the two classes of supply and these systems. Generally, however, with the exception of wide speed variation work all modern developments are a.c. Nevertheless, mainly because of the increasing demands on the existing cranes, the d.c. consumption is still growing. There are twenty-five d.c. switch houses throughout the system.

Motor housed in a pit with fluid coupling drive for lock gate winch

The Port Authority operates four granaries which are interconnected by band conveyors for the interchange of grain. Any one granary can be supplied from any one berth on the Royal Edward Dock, and generally the two older granaries are fed by conveyors in tunnels along the quayside while the more modern installations are served by bands in overhead galleries. Throughout the whole system there is a total between-centres length of conveyors of 22,746 ft., made up of 102 separately driven conveyors. The longest conveyor is 600 ft. between centres and its 24-in. troughed band runs at 800 ft. per minute. It is driven by a 30-h.p. motor with a chain reduction drive as a self-contained unit.

Over a million tons of grain were handled last year and the consumption for that part of the work done by the Authority itself was 1.2 million kWh. There are 174 a.c. motors on the system, totalling 2,096 h.p., while the 89 d.c. motors represent an installed h.p. of 1,226.

Grain can be fed to the overhead bands by floating and quayside elevators. The latter remove the grain from the ships' holds by suction and deliver it to bucket elevators on the structure which serves the quayside conveyors. The operations of the floating plants are practically the same except that final delivery to the conveyors is carried out by separate hinged conveyors housed on the travelling pneumatic elevators. The quayside underground conveyors can be fed only by the floating equipments. Each quayside pneumatic elevator has a capacity of 80 tons per hour and the necessary suction is created by a Reavell two-stage turbo-exhauster which runs at 8,500 r.p.m. and is driven through David Brown gearing by a 130-h.p. 2,950-r.p.m. s.c. motor served by an auto-transformer starter with push-button control. The travelling elevators are supplied *via* sliding contacts from bare conductors on the fronts of the shed.

There are nine other motors on each quayside elevator which bring the total h.p. up to 200 and serve for such operations as elevating, conveying, rotary sealing, winch driving and suction-pipe manipulating. The floating pneumatic elevators have Diesel-engine suction drives but the auxiliaries are electrically operated and supplied by 50-kW Diesel-driven generators on the crafts. The motors, which vary in size up to 20 h.p., are all d.c. and mostly totally enclosed and are largely controlled by marine-type starting equipment.

Bananas are another commodity which require special handling equipment. Portable combined elevator, conveyor and lowering equipments embrace an endless-link conveyor with a loose canvas fold in each link. The body of the conveyor is placed so as to span part of the ship's deck and the quay and one end of the flexible chain has a "drop" into the ship's hold while the other end has a "drop" to a quayside conveyor.

In the ship's hold banana stems (150 to 200 bananas) are placed in the canvas folds from which they are automatically tipped at the other end of the equipment. From the quayside conveyor the stems are delivered to special railway wagons for distribution. The portable conveyor system is self contained with its driving motor which is supplied from the quay *via* a plug connection and trailing cable.

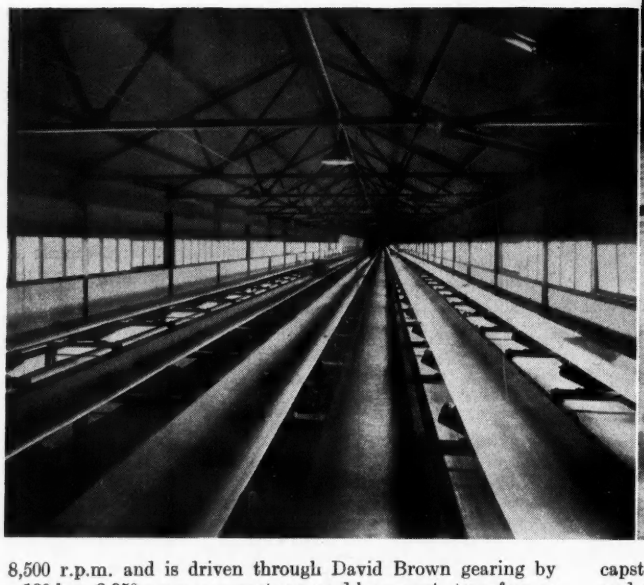
The total consumption of cranes and shed machinery last year was 223,770 kWh. There are forty-four d.c. cranes with 142 motors totalling 2,779 h.p. and ten a.c. cranes with 38 motors totalling 631 h.p. On the roof of transit sheds near the granaries are Stothert & Pitt level luffing, loading and unloading cranes which are unusual in that they are operated by s.c. motors. These English Electric units have a high starting torque and the hoisting motors are arranged on a two-speed basis (500 to 1,000 r.p.m.) by means of pole-changing windings. An Igranic contactor-type controller serves the hoisting motor, and drum-type controllers of the same make govern the slewing, luffing and travelling motors.

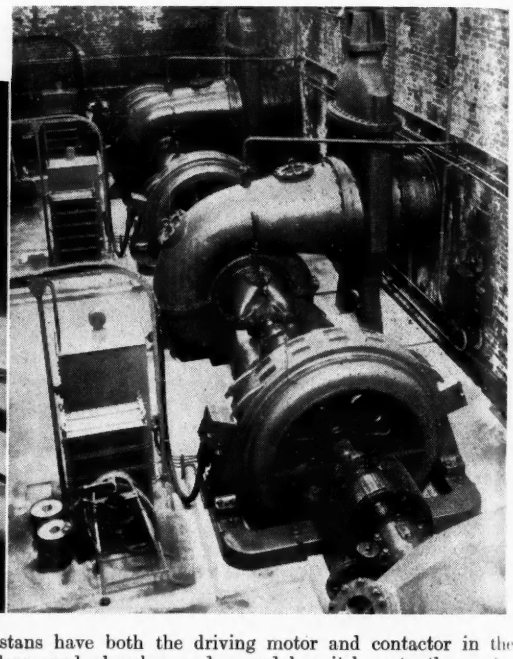
Novel Lock Gate Driving Scheme

Conversion from hydraulic to electric operation of the lock-gate winches at the Avonmouth Dock is clever as well as novel, for a satisfactory means has been found to obtain the necessary "hydraulic-engine" characteristics for the drive on to the chain drum of the winch. Each of the twelve winches is fitted with a 20-h.p. s.c. motor which drives the winch gearing through a fluid coupling so designed that the torque transmitted cannot exceed a safe value with regard to the strength of the driving chains which close and open the gates. The complete drive is housed in a pit in the quayside, as also is the control gear which consists of a direct-on-line contactor without overload relays, but with high rupturing capacity fuses.

About the docks there are eleven d.c. capstans with a total h.p. of 330, and twenty-three a.c. capstans, including those in course of erection, with a total h.p. of 690. All the a.c. capstans have both the driving motor and contactor in the underground chamber and a pedal switch puts the motor direct on the line. An interesting point is the satisfactory maintenance of the contactor gear which has been found to be largely due to the small but continuous heat dissipation from the neighbouring pilot relay coil. The d.c. capstans are also pedal operated and have a starting resistance which is progressively cut out of circuit by the running of the capstan *via* a pulley on the motor shaft.

Left: Conveyor bands in gallery leading to the granaries. Right: Two of the main sets in the new graving dock pump house

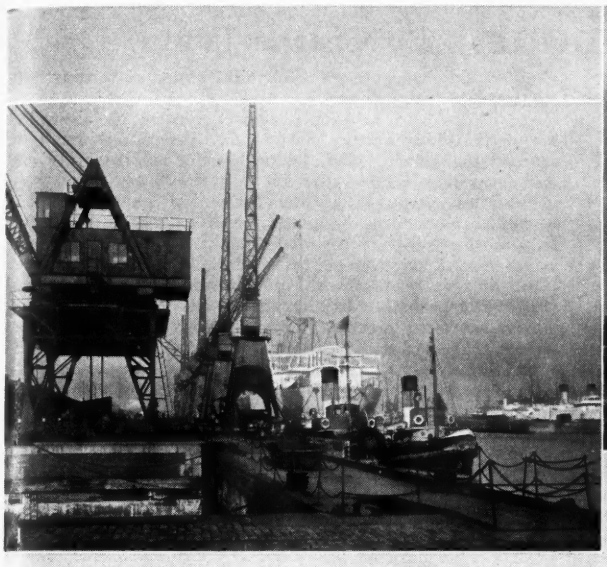


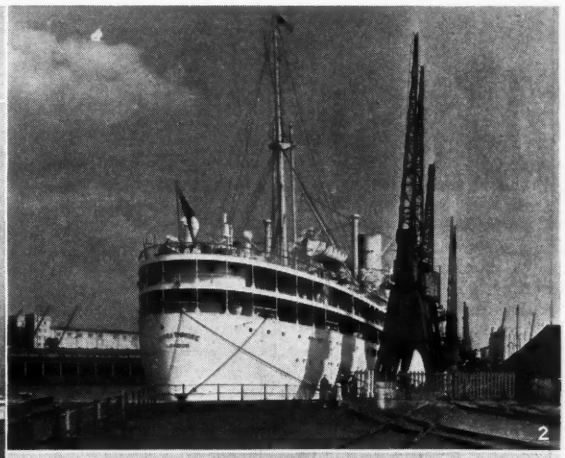


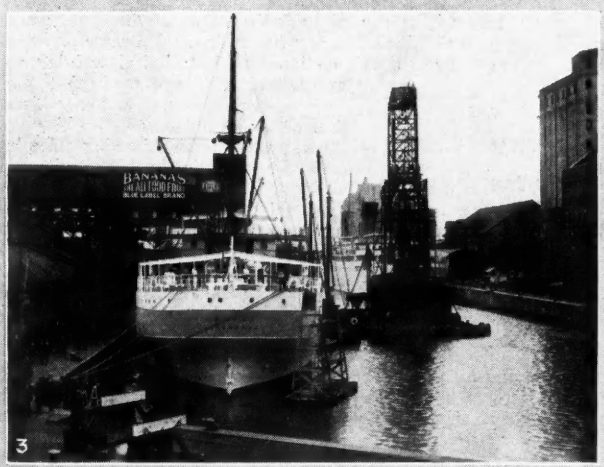
For de-watering the graving dock and providing make-up water for the main dock a new pumping station has recently been installed. It houses three pumps, each driven by a 650-h.p. 6.6-kV G.E.C. motor. The stator of each unit is supplied through a solenoid-closed circuit-breaker, while the rotor is served by a contactor-type controller, the whole being under push-button control, with interlocks to prevent more than two pumps being run simultaneously as a maximum-demand limiting scheme. The pump output valves are hydraulically operated through solenoid-governed valves interlocked with the control gear so that in the event of a pump stopping, water will not flow back.

Over three million cu. ft. of water is contained in the 850-ft. by 100-ft. dock and one pump will empty the dock in six hours. The dock is emptied for a total consumption of 2,553 kWh, with a maximum demand (one pump) of 452 kW. The consumption for the first 10½ months' working of this pumping station was 1.4 million kWh.

While for such operations as driving the main entrance lock gates and sluices, and junction-cut swing bridge and some of the capstans, hydraulic power will be used directly for prob-







Cargo-handling Equipment at the Avonmouth Docks. (See previous pages)

1. Quayside cranes with 25-tonner at entrance to graving dock. 2. Battery of d.c. cranes near the s.s. "Strathmore." 3. Discharging bananas. 4. Quayside crane activity. 5. Unloading grain by a quayside pneumatic travelling elevator. 6. A floating pneumatic elevator at work

Dilution of Labour. By Charles John

Causes and effects

MUCH has been spoken and written lately on dilution of labour. Some see in it new hope for many of the unemployed of this country: others speak bitterly of skilled workmen replaced by unskilled men and women. Even the definition of the phrase is not clear, and is often arrived at in accordance with individual views. The truth is that there are exaggerations on both sides, and there are limitations both to the good and the evil which this dilution can accomplish.

At times like the present, when the engineering industry is overwhelmed with orders, a shortage of skilled labour is almost inevitable. It can be argued that the fault lies with the employers, because they did not train more apprentices during the lean years, but the fact is that this is often costly, and cannot be entertained when business is slack and expenses must be reduced to a minimum. Individual firms have reason to be chary of educating large numbers of apprentices during slack periods, as, when better times arrive, these young men who have few ties to bind them to one firm, are offered larger wages by other manufacturers who are sharing in the increased business activity.

This has been particularly noticeable in the electrical engineering trades. Electrical engineering firms have been amongst the foremost in evolving and maintaining apprentice-training schemes, but their experience during the last two years has been particularly bitter. Thousands of young men, many of whom were trained during the difficult years of the depression, have left the electrical manufacturing trades entirely, led away by the high wages in newer industries, such as the aero industry.

Again, the training of large numbers of apprentices is viewed with suspicion by many people, and has even been classed as dilution of labour. Some trade unions claim that the modern apprentice system serves to provide cheap labour which tends to oust the skilled worker from his position. They maintain that the number of apprentices should be proportional to the skilled men employed. Whilst one can consider this sympathetically it is obvious that if it were conformed with during a "slump" period then, as business improved, there would be little new skilled labour upon which to draw, and dilution in its most virulent form would be inevitable.

The author says that "dilution" is often forced upon employers against their wishes and better judgment

Realities must be faced, and if the labour available to industry is not adequate or suitable, then steps must be taken to remedy the situation. People cannot be taken from the distressed areas, or anywhere else, and be expected to do the work of skilled men, and it is here that modern machinery and tools, together with up-to-date methods, come to the rescue. This re-equipment with new tools and machines is a costly business, and often entails the entire revision of the works system, together with the addition of highly paid staff in the jig-and-tool drawing office. It is only when the manufacturer is assured of a steady stream of orders for some years to come that he feels justified in incurring the heavy additional expenditure.

In the event of a business depression the extra capital he has expended will prove a heavy burden. Men may always be "stood off," but machinery represents capital and is always depreciating. Many an employer would prefer to extend in a much more gradual way the use of the expensive machinery in his factory with the attendant unskilled and semi-skilled labour. Circumstances force his hand, and the lack of suitable men, together with the steady flow of workers to other industries, and the consequent inflation of wages, force him to adopt more mechanical means of turning out the work.

Most people connect dilution of labour in the engineering industry solely with the workshops, but actually the drawing office has seen quite a large inflow of men from other departments.

The very fact that works are using more unskilled labour means additional work in the drawing offices, particularly the jig-and-tool departments. With the almost fantastic wages offered by some of the newer industries, such as the aero industry, there has been a steady exodus of draughtsmen, particularly from the electrical trades. This means that employers have had to draw young men from the toolroom, the pattern-shop, and other departments in an effort to fill the gaps. It is obvious that they have done this with the greatest reluctance, for these men are valuable in their own trade and their departments are complaining of the lack of suitable labour.

The Association of Engineering and Shipbuilding Draughtsmen set up a committee to investigate this matter, and its findings are of interest. It decided that for the purposes of the investigation dilution of labour should be defined as the entry of semi-skilled or unskilled workers under rates of wages or conditions that tended to worsening. The committee found that in very few cases had low wages been forced upon new draughtsmen and that general worsening of office conditions was correspondingly rare.

The definition of dilution adopted by the draughtsmen shows that they are not greatly concerned with the influx of new men into their trade, believing that so long as their wages are kept to the normal level the status of the draughtsman will be maintained. In any future depression these new men, who are not so well equipped with technical training and experience, will have to fight a hard battle against the old-established draughtsmen.

One section of the drawing office has cause for complaint in this respect. An ordinary trade apprentice is usually indentured when he is sixteen and finishes his apprenticeship when he reaches the age of twenty-one. The D.O. apprentice, on the other hand, nearly always has to have a secondary school education, and often does not start work until he is seventeen or over, and then sometimes has to serve a longer term. He thus sees young men from the shops being transferred to the drawing office, on the completion of their apprenticeship, and receiving the usual starting wage, whilst he has to wait for another year or more before he receives the same money. The man from the shops has gained a start from him both as regards wages and seniority.

It is natural that when skilled men see some of their work being performed by machinery and unskilled labour they should have misgivings as to their future—it has been so since the advent of machinery in industry. History has proved that if it is economical to do work with machinery and comparatively cheap labour, then these methods will eventually prevail. The fallacy is to think that this will be the deathblow of the skilled workman. This so-called dilution of labour, at times like the present, is often forced upon the employer against his wishes and better judgment. He is still eagerly searching for suitable skilled labour, and training, often at great expense to himself, a large body of young men who will eventually swell the ranks of engineering tradesmen. Just as there is always a future for engineering, so is there also a future for the skilled engineer.

The Avonmouth Docks (*Concluded from page 918*)

ably many years to come, hydraulic drives are being progressively converted at convenient times at many other points about the docks. But as the result of replacing the existing steam-driven hydraulic pumping station by an electrically driven one the docks staff are looking forward to being able to claim in the near future that the docks as a whole are all-electric.

The new station near the main entrance locks will house two 130-h.p. motor-driven pumps and one stand-by Diesel-driven set. The output of each pump will be 190 gal. per minute against 750 lb. per sq. in. and the motors will be automatically controlled by tappet switches on the hydraulic accumulator.

For the accommodation of meat, dairy produce and fruit there is extensive cold storage (500,000 cu. ft.) in which some rooms are served by direct expansion, while in other rooms cold air drawn through coolers served by the common compressor plant is circulated. The three main ammonia compressors are belt driven by 115-h.p. motors, while the sixteen motors in the whole installation, including the drives for some very large lifts, total 558 h.p. The consumption of the refrigeration plant last year was 397,568 kWh, representing 5,120 compressor running hours.

The two lighthouses, one on the pier on either side of the main entrance channel, are both electrified and have automatic lamp-changing gear. A fog bell and a lamp-flasher are also electrically driven, while the complete system of navigation lights is now entirely electric. For quayside services the Authority has a comprehensive fleet of electric trucks and the consumption for charging these last year was 25,680 kWh.

Superheaters

By V. Walker, A.M.I.E.E.

The effect of high steam temperatures on design is discussed by the author, who deals with some recent developments

WITH boiler units designed to take advantage of the economies inherent in the use of high temperatures and pressures, the trend in superheater design is towards greater absorption of heat by placing the elements closer to the furnace. The amount of boiler heating space interposed between the furnace and superheater in the latest designs is limited to that necessary to reduce the temperature of the gases sufficiently to prevent slagging of the superheater tubes, and to keep the temperature of the tube metal within the requisite limits. Experience with installations already in service appears to show that many of the troubles anticipated with steam temperatures of between 800 and 900 deg. F. have not been realised. There is no doubt, however, that temperature control should be used with higher values, subject to which high temperatures can safely be obtained over a wide range of steam output.

A number of boiler designs (both of the cross-drum and vertical-tube type) capable of high rates of heat input per foot width of furnace are particularly adaptable to the control of superheat by regulation of the gas mass flow over the superheater by dampers at the boiler exit. This has the advantage of lower draught loss due to by-passing part of the gas around the superheater at high capacities.

It also affords a means of protecting the superheater tubes during starting periods as in some designs all of the gas can be by-passed around the superheater if necessary, until sufficient steam is generated to maintain a safe operating temperature. The arrangement of the steam flow within the superheater units in relation to the gas flow outside the tubes is of the greatest importance, in order to maintain the proper gas temperature in relation to the final steam temperature at the outlet of the superheater.

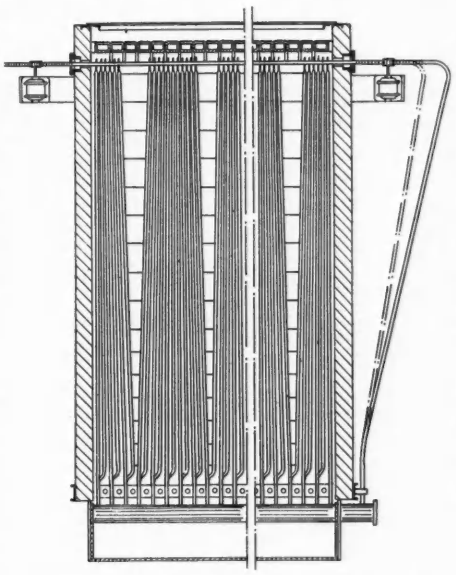


Fig. 1.—A recent design in which some of the tubes of the superheater are movable in relation to others in order to control the final steam temperature

In some cases a combination of parallel and counter flow is employed the first with high and the second with lower gas temperatures. This has the distinct advantage of placing the outlet or hottest element in a more moderate gas temperature zone for protection against overheating. The choice between parallel and counter flow depends, however, on the final steam temperature required for a given flue-gas temperature in the superheater inlet zone. Below certain gas temperatures, the minimum depending on the final steam temperature, parallel flow ceases to be applicable, since the exit gas temperature at the superheater outlet begins to approach the steam temperature prevailing in the high temperature part of the superheater coil which, in the case of parallel flow, is situated in the zone of lowest gas temperature.

Superheaters for very high temperature, will, therefore, usually be designed for counter flow. The parallel-flow superheater requires a larger amount of heating surface than the counter-flow design, the amount increasing with the decrease in flue-gas temperature at the inlet zone.

With double-outlet vertical-tube boilers superheaters of the compensator type have been employed to maintain a constant steam temperature. In one arrangement there is more superheater surface in one side of the boiler than in the other, and the gas flow is proportioned by dampers in the boiler outlet flue. A section of radiant elements is installed between the front boiler tubes on one side, and on the opposite side there is a large section of convection elements as well as radiant elements. The gas flow over the convection elements is increased on light loads. Another design allows an equally divided gas flow over the two sides of the boiler at all ratings, there being an equal section of radiant intertube units among the first bank of boiler tubes and a section of convection elements in the second pass on either side of the boiler. A free gas pass is arranged at the back of the convection elements so that part of them can be by-passed, the steam temperature being controlled without by-passing any of the boiler heating surface.

In one recent design (fig. 1) some of the tubes of the superheater are movable in relation to others in order to control the final steam temperature. The superheater is disposed between the tube banks of the boiler and consists of flat coils of hairpin shape flexibly connected to headers. The movable supports of each coil comprise studs connected to a tubular actuator and are caused to move by the rotation of a pinion wheel driven by a motor and engaging in racks on the external wall of the actuator tubes. The coils may also be arranged in groups of three, the outer coils of each moving sideways towards and away from the middle coil which is fixed. The coils of the actuator then move simultaneously in opposite directions. Tube shields of tiling, grooved so as to interlock with the upper and lower pairs of tube length in a movable coil, effect an increased protection of the elements at high boiler ratings. The tube actuating motor may be thermostatically controlled in order to maintain a constant superheat.

In another design control depends on the correspondence between the rate of heat transfer and the velocity of the hot gases past the heating surface. As the temperature of the superheated steam tends to rise with load increases, a free passage is provided for the gas on full load; this is gradually restricted as the load is decreased, so that the velocity is increased. This arrangement is shown in fig. 2, the superheater being sandwiched between the steam raising tubes B and C. Two fixed baffles are arranged at E E, and a series of hinged baffles or dampers is also arranged at FF. The dampers are closed to make a narrow tortuous path for the gases at low load, but they may be opened progressively to permit a more free passage as the load increases. Unlike a simple by-pass arranged to regulate the final steam temperature, the whole of the gases is subject to the same treatment. Automatic control for the hinged dampers can be arranged if necessary.

Possible Troubles

The failure of superheater supports often results in sagging and warping of the tubes. Hangers usually fail in the lower rows nearest the fire. Nickel-chrome supports have been used to retain the front and intermediate sections, but have failed by cracking and wearing away to a very thin section. Alloy iron has been used in place of cast iron with fair success. Improvements have been accomplished by carrying the lower elements through the upper loops by means of slip spacers of tongue and groove arrangement welded to the superheater tubes from which they receive considerable cooling effect. The upper loops of the superheater are carried on conventional hangers situated in the lower temperature gas zone. Supports have also been cooled by forming part of the steam raising section of the boiler, the water being circulated (in cross-drum boilers) from the front headers through the superheater headers to the main boiler drum. The headers also

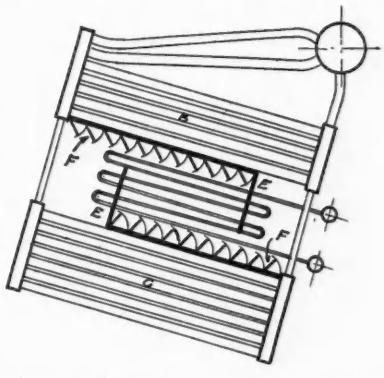


Fig. 2.—With this arrangement control depends on the correspondence between the heat transfer and the velocity of the hot gases past the heating surface

provide support for the gas baffles. Trouble is common with leaking joints where the tubes are expanded into the headers, particularly when the latter are within the boiler casing. Where alloy tubes are expanded into carbon steel headers, leakage may be expected because of the greater co-efficient of expansion of most alloys. Some alloy tubes are brittle at room temperatures and need care in handling. The latest developments completely eliminate in effect all joints in the superheater, but permit of the elements being replaced. The nipples to which the joint is applied are welded to the superheater header; a welding ring is then applied between the tube and nipple and an electric weld made. After stress is relieved with an acetylene flame, the sleeves and outer collars are screwed into place.

Reducing Solid Content

The percentage of moisture and solids in steam leaving the boiler unit has become a major consideration in recent years. For low steam outputs baffles are employed in the boiler drum. For high capacity and for units in which it is of the utmost importance that solids in the steam be reduced to an absolute minimum, the reduction in solids content is obtained by employing the entering feed-water at low concentration for washing the steam leaving the drum in conjunction with effective scrubber sections through which the steam passes after the washing process. In another recent arrangement in which the steam supply is purified before superheating, the steam is passed over highly heated surfaces on which the impurities are deposited, the surfaces being cleaned at times when the steam supply is stopped. Steam from the boiler drum 1 in fig. 3 flows over closely spaced tube coils 9 through which flows superheated steam from the boiler superheater 2. Steam from the coils is returned to the superheated steam supply pipe 5 by an injector 12. The coils may be cleaned by water jets from pipes 18. Flue gas, it is suggested, may be passed through the coils instead of steam. The coils may also be placed in the boiler drum.

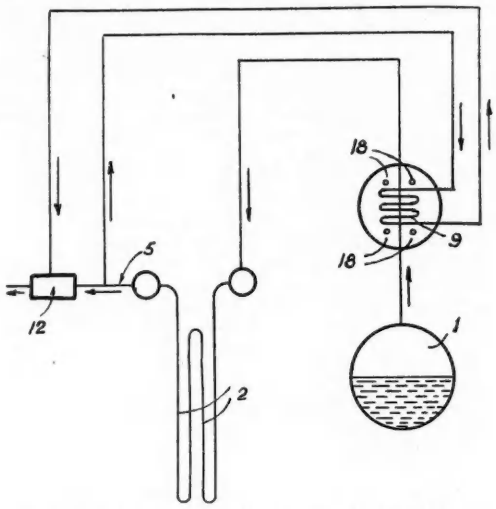


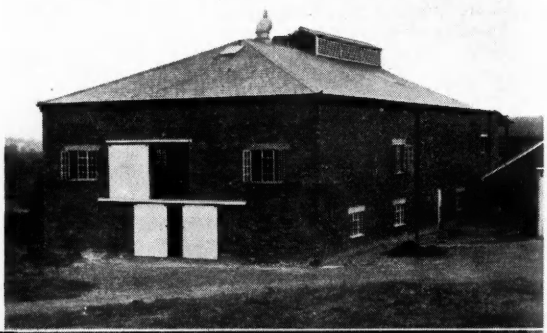
Fig. 3.—Steam purification before superheating

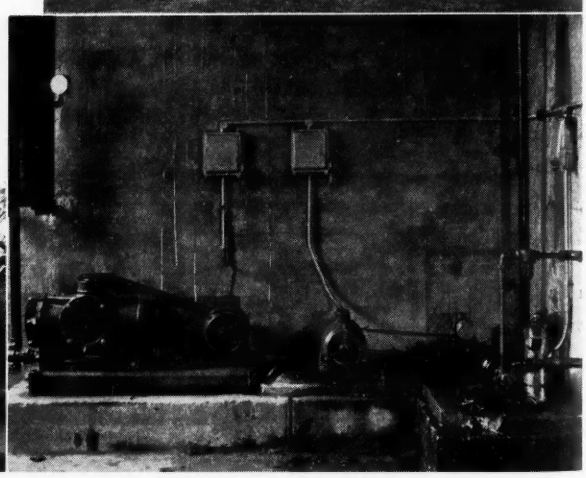
Quicker Hop Drying

WITH the aid of electricity the process of drying hops has been speeded up by about 75 per cent. on the farm of James Day & Sons at Staplehurst, Kent, which is one of the most modern all-electric farms.

Some of the old-fashioned oasthouses have been brought up to date by the use of electric fans, housed in wooden structures at the sides of the roof. In the more modern oasts at this farm the equipment includes an oil furnace, which has replaced the coal fire, and a 5-h.p. motor drives a 4-ft. fan which directs the heated air through the floor of the drying room above. With this type of installation the temperature and air-flow are both under control and independent of natural vagaries. Sulphur, vaporised by an electrically heated pan, is mixed with the stream of heated air, so adding colour to the hops. There are two drying rooms with a control room between, whence the air circulation can be varied by closing or opening ventilators. Electric motors are used for the two air compressors on each of the oil-fired furnaces and on the oil pump. For the fans added to the older type of oast the horse-power is usually about 1½.

In addition to the saving in time, the electrical method of drying the hops, with accurate control of temperature and draught, means greater consistency in quality. The oasts mentioned were equipped by the Weald Electric Supply Co., Ltd., and wired throughout, both for the motors and lighting, with heat-resisting wire. The special wire and other cables were supplied by Callender's Cable & Construction Co., Ltd.





Top: One of the oasthouses. Bottom left: An old-fashioned Kentish oasthouse converted for electrical power. Bottom right: Electrical equipment

For drying, the hops are shaken out of the "pokes" on to a horsehair mat, which covers the open-work floor. When they are dried the mat is rolled to the end of the floor for easy unloading of the hops and pressing them into "pockets" ready for despatch.

Three small electric motors have taken the place, but not the space, of the boiler and steam plant for driving the air compressors and oil pump. For the fans added to the older type of oast the horse-power is usually about 1½.

Transformer Tank Corrosion

By S. R. Mellonie, A.M.I.E.E., A.Am.I.E.E., and W. E. Nettleton, A.I.E.E.

Deterioration of insulating oil and the effect of breathers

Conclusions arrived at as a result of the study of a number of cases of corrosion

THE following notes are based upon observations of a number of instances of corrosion of transformer tanks, some of them serious. They do not partake of the nature of an investigation, but in view of the need for more knowledge of the results of acid formation in insulating oils they are presented in the hope that they may lead to suggestions as to cause and cure.

In one case breakdown occurred due to vapour from the oil attacking the tank top-plate and lead and brass fittings under normal service. The possible extent of damage from this cause may be judged from the fact that a $\frac{3}{16}$-in. steel top-plate was perforated, and the whole underside of the cover peeled off in large cakes of rust.

It has been suggested that the tendency of transformer oils to form fatty acids in service is due to the additional refining processes now adopted to reduce the sludge value. A few cases have been found where high values of acidity and sludge have both been present, but generally speaking an oil which has high acid value is very clear indeed while still warm, but may become cloudy when cool. In other cases the oil has turned a bright green colour and is perfectly clear, without signs of sludge, the acid value being of the order of 1.7 (mg. KOH)*. The colour of a bottle of this green oil, which was placed in the sunlight for a few weeks, gradually returned to the normal amber; an analysis of a white deposit on the bottom of the bottle showed that fatty acids were present.

The existence of high values of acidity is indicated by a characteristic pungent smell and often during the early stages a very dry surface on the under-side of the lid. Such oils invariably contain moisture which, when extracted by means of a vacuum centrifuge is highly corrosive. Presumably as the transformer warms up this moisture is evaporated and condensed on the under-side of the cover resulting in serious corrosion. The current B.S. Specification limits permissible acid value to 0.2, whereas trouble due to excessive acid starts with values of 0.7 when the transformer is unable to breathe freely, and transformer covers have corroded through with values of this order. On the other hand, where the transformer could breathe freely values as high as 4.4 have been found without corrosion.

Increase in Acidity

Reference to available records indicates that transformer oil as received from the suppliers has an acid value of 0.01 to 0.03. After a number of years' service under favourable conditions the acid value may increase slightly as shown in Curve A, but under adverse conditions it may rise rapidly as shown by Curve B. These curves indicate limiting values which have come to our notice. The figures between the two curves refer to the cases quoted in the text.

We know of no suitable method of removing the acid, but it should be emphasised that oils with a very high acid value are giving satisfactory service where the transformer can breathe freely. The extent to which the transformer is able to breathe is a very important factor. The older transformers could in general breathe freely *via* an ill-fitting cover and the cable orifices, but later designs with cork gaskets under the covers and sealed cable entrances have given trouble. Many of these have since been provided with two ¼-in. holes in the tank side above the oil level to give restricted breathing.

Small underground transformers placed in steel tanks without breathing facilities have suffered extensively from corrosion due to acidity. In many cases where the transformer has been installed less than two years the tank and the core show definite signs of corrosion. The oil in such cases has been found to contain a great deal of water and to give a low breakdown value, the acid value being between 2.0 and 3.0.

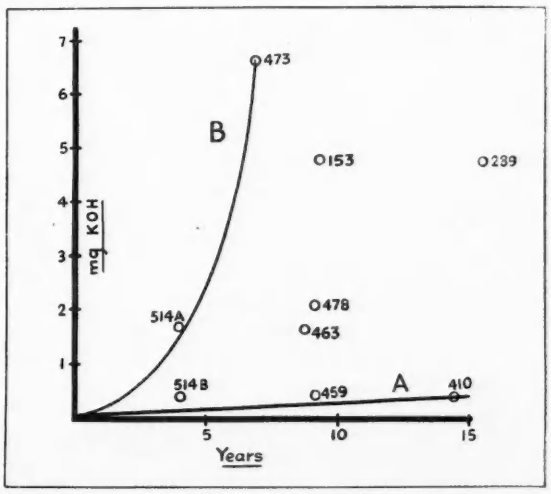
The conflicting nature of the evidence available may be gathered from the following details. In the cases quoted, except where otherwise stated, the transformer was of the indoor type, without conservator or breather, installed in an above-ground brick building. Further, as operating temperature is an important factor, it may be stated that the transformers have not been overloaded and that the ambient temperature was always much below the B.S.I. limit.

*See British Standard Specification 148-1933. Appendix 8.

Ref. 459.—A 500-kVA transformer was connected continuously to a normal industrial load. The tank fittings were such that breathing could not take place. When put into commission eight years ago The Grade A oil had an acid value of 0.03. A year ago the value was 0.16 and the oil had the characteristic pungent smell and withstood the B.S.I. breakdown test. The cover was not corroded but the under-side was very dry, a feature noted in other cases. At this stage restricted breathing was provided by fitting a ¼-in. tube in the cover, and the acid value has since risen to 0.26 without evidence of corrosion.

Ref. 463.—The transformer and conditions were similar in every way to Ref. 459, the tank being pactically air-tight. That no breathing was possible was confirmed by the audible intake of air when the cover was lifted. When installed nine years ago the Grade A oil had an acid value of 0.03. After 7¾ years' service this had risen to 1.74, the breakdown value being 24 kV. An examination of the cover showed an advanced state of corrosion, a great deal of the under-side having fallen into the oil forming a considerable pyramid of rust on the core. The transformer was removed from the tank and cleaned by washing down with new oil. The tank was similarly treated and the transformer replaced in service with new Class B oil and provided with a calcium breather. The acidity was then 0.09 which has since risen to 0.75 in twelve months without evidence of further corrosion.

Ref. 153.—A 100-kVA transformer was installed in a pit, the tank being sealed by a bolted cover with cable boxes on both sides. When put into commission eight years ago the acid value of the oil was 0.03. A recent examination showed that the acid value had risen to 4.57 and that serious corrosion had occurred, the cover, tank and core all being attacked to such an extent that the transformer had to be scrapped. This condition was typical of several. The breakdown value of the oil was less than 10 kV.



Increase of acidity of transformer oil

Ref. 514.—Two similar 216-kVA transformers forming a Scott bank were installed in a brick building in 1932, the acid value being 0.03. The tanks were sealed by cable glands on both sides, and were practically air-tight. After four years' service one failed due to flakes of corroded metal dropping from the top cover on to exposed high-voltage tapping connections. The acid value was 1.46, the breakdown value being less than 10 kV. The lead on the cable protruding into the tank was corroded and covered with a white powder; for this reason designs in which the lead of the cable is exposed to the oil vapour are undesirable. The second transformer showed no signs of corrosion and the acid value was only 0.36; the breakdown value exceeded 30 kV.

Ref. 556.—Two similar 1,000-kVA transformers delivered at

the same time by one manufacturer were installed in the same brick sub-station. Restricted breathing was provided by a ¼-in. hole drilled in the tank side near the top plate. After eighteen months' operation in parallel the acidity of one had risen from zero to 0.09 and the other from 0.03 to 0.45 but in both cases the breakdown value exceeded 30 kV. Inspection showed no evidence of corrosion.

Ref. 289.—A 1,000-kVA indoor transformer was installed in a brick sub-station seventeen years ago. The acidity value of the oil at that time is not known, but after sixteen years' service the value had risen to 4.4, the breakdown value being 24 kV. An inspection showed heavy sludging of the oil but no sign of corrosion. The construction of the transformer allowed free breathing *via* holes for low-voltage connections. The transformer was cleaned and refilled with Class B oil which had an acidity value of 0.03. This after one year's service had risen to 0.37.

Ref. 410.—A 4,700-kVA outdoor transformer without conservator, but fitted with a calcium chloride breather, was placed in commission fourteen years ago, the acidity value of the oil being unknown. The present value is 0.06, the breakdown value being 30 kV, and there is no sign of corrosion. One interesting point may be mentioned in connection with a group of transformers operating under such conditions. An examination of the breathers fitted to those transformers on a regular load cycle showed that more moisture had been absorbed at the transformer end than at the atmospheric end of the breather. In a similar transformer installed as a spare out of doors and not connected, the breather did not show such signs, and further the oil was superior in breakdown value and acidity to that in transformers regularly on load.

Ref. 478.—A 12,500-kVA outdoor transformer fitted with conservator and calcium breather was installed eight years ago when the acidity was 0.01. This has risen to 0.21 but there is no sign of corrosion, the breakdown value exceeded 30 kV.

Ref. 473.—A 300-kVA transformer of the indoor type was installed seven years ago with an acid value of 0.02 which has risen to 6.76. The breakdown value exceeds 30 kV. Restricted breathing was possible *via* the low-voltage connections. The under-side of the top plate was covered with a thin layer of cork and painted with an oil-resisting enamel. Examination showed some sludge but no corrosion. The transformer was cleaned down and replaced in service with new oil which had an acid value of 0.02. This had risen after one year to 0.4.

Conclusions

The conclusions to be drawn from these examples may be summarised as follows:—

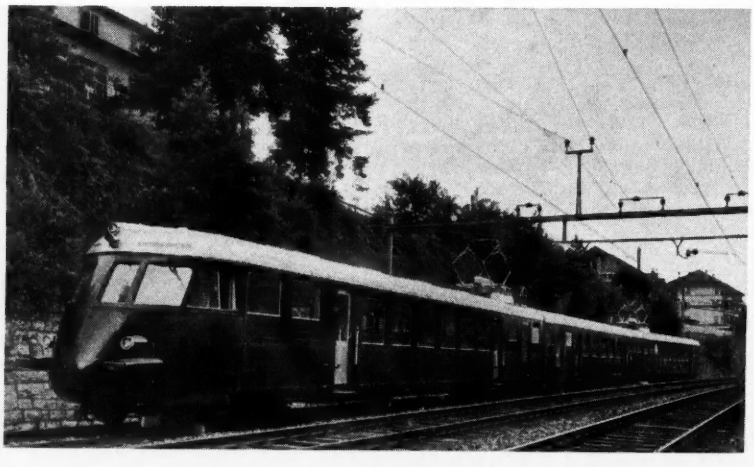
1. Acids form in all cases but in varying amounts even where conditions are the same. (Ref. 514 and 556.)
2. The presence of acid does not necessarily cause corrosion. (Ref. 459 and 473.)
3. In all cases where the transformer is practically airtight and there is a layer of air sealed above the oil, serious corrosion may be expected. (Ref. 153 and 514.)
4. Restricted breathing does not prevent formation of acid but does prevent corrosion. (Ref. 410 and 473.)
5. The presence of small quantities of contaminated oil, such as could be left on the inside of transformer coils after cleaning, seems to accelerate the rate of acid forming in new oils. (Ref. 463 and 473.)
6. Sludge is rarely found in oil with a high acid value.
7. The protective value of anti-corrosive paint and cork is doubtful because, although effective in the case of Ref. 473, the vapour has been known to penetrate ⅛ in. thick compressed cork packing and cause heavy corrosion on a steel plate.
8. It appears desirable to fit breathers on all indoor transformers as no case of corrosion has come to our notice where a breather was in service.

Acknowledgements are due to Mr. L. Romero, city electrical engineer, Salford, for authority to publish these results, and to Mr. A. Dickinson, technical assistant at Agecroft power station, for the figures of acid values.

New Swiss High-speed Trains

THE two high-speed triple-car electric trains just delivered to the Swiss Federal Railways not only form a type of operating unit new to the 15-kV 16.6-cycle single-phase electrified lines in Switzerland, but they embody a notchless system of control not used previously in traction work.

With eight motors having an aggregate one-hour rating of 2,350 h.p. at 71 m.p.h. and a continuous rating of 1,985 h.p. at 77.5 m.p.h., and coupled permanently in parallel so far as traction circuits are concerned, the trains have the high acceleration rate for an express unit of 1.2 to 1.3 m.p.h. per second averaged over the full speed range, and on the level they can attain their maximum speed of 93 m.p.h. in 120 sec. The motors are wholly spring-borne, and their torque is transmitted to the 35½-in. wheels through individual axle drive, of the Oerlikon type in the first train and of the Secheron pattern in the second. The tractive effort at the wheel rims is 11,700 lb. on the one-hour rating and 19,200 lb. at starting and low speeds.



One of the new trains of the Swiss Federal Railways

Usually on a.c. vehicles the voltage changes at the motor terminals are controlled by taps on the transformer winding, but for installation in these new Swiss trains Brown-Boveri evolved a tapless system which gives smooth and notchless acceleration, leading to a fuller utilisation of the adhesion weight and eliminating the step-transition choke coils, damping resistances, and on-load contactors usually employed. The secondary winding of the transformer is wound spirally over the primary winding on the core, but is concentric to it. Rolling contacts run on the bare edge surface of the secondary winding, by which they are guided, and collect the current; the rollers are operated by a carrier piece driven by a small electric motor.

Remote control of the voltage regulation is through a polarised relay, one coil of which is branched between two potentiometers and the other on the lighting battery. The relay works on a change-over contact with a recall spring, and when the sliding contact of the potentiometer in the master controller is moved, through the switching forward of the controller handle, the first coil of the relay is supplied with current until the contact of the potentiometer on the transformer, moved along by the carrier piece, has attained a corresponding position.

A system on this principle permits the controller to be formed virtually of an incoming lead and a commutator-shaped potentiometer as far as the traction circuits are concerned, but in these Swiss trains a number of contacts and slip rings are incorporated in order to deal with the electric braking, which is of the stepped type. During retardation periods the motors, now grouped in series-parallel, are excited from a battery and act as auto-excited generators; the braking energy is absorbed by air-cooled resistances. As the electric brake cannot function to a dead stand, an electro-pneumatic valve is fitted to bring into action over the lower speed range the ordinary air brake on the centre coach of the train. In emergency and special stops full air brake power is used on all wheels in conjunction with the electric brake, the rate of retardation being 2.6 m.p.h. per second.

The body frames of the three coaches are electrically welded and are covered with panel plates and roof plates of light alloy.

The tare weight of a train is 115 tons, of which the electrical equipment accounts for 40 tons. There are 192 third class and 30 second class seats, arranged principally in eight electrically heated saloons. The streamlined casing extends over the full 225 ft. length of the train. The transformers and most of the auxiliary electrical equipment are located in compartments on the end vehicles, immediately below the pantographs.

These new trains are intended for employment mainly in the central and south-western parts of the country, such as the Zurich-Berne-Lausanne-Geneva route.

Developing the Cooker Load

By J. Allen*

Demonstrations and window displays

Originality is essential in the face of competition from other cooking media. The author quotes examples of methods adopted in Bury

ALTHOUGH, in certain localities, electric cooker business appears to be almost self-developing, in the majority of supply undertakings much serious work has to be done in order to substantially increase the cooker load.

The "bombshell" methods adopted by some undertakings have a great deal to commend them, but unfortunately these schemes create many obstacles which are almost insurmountable and may easily jeopardise their success. It is not within the scope of this article to discuss such schemes but rather to dwell on the development of accepted ideas in connection with increased cooker output.

Demonstrations still form a very important factor in cooker development, but poor attendances are experienced in the demonstration theatres of many supply authorities in all parts of the country. This lack of enthusiasm may have many causes, but it would appear that the chief of these is that the general public today receives so many invitations to attend cooking demonstrations, by fat, water, electricity, gas, steam, coal and many other methods, that an ordinary invitation issued by a supply authority has lost much of its appeal.

WEDNESDAY, THURSDAY and FRIDAY,
NEXT WEEK!
MATINEES AT 3-15 p.m.

"THE PROOF of the PUDDING"

— FEATURING —
MARION LAWSON
WITH
ALEC TRICITY.

A Story that will astound you by its very truthfulness. "See and Hear" how you can obtain EASIER, CLEANER, HEALTHIER and BETTER COOKING.

MISS MARION LAWSON, IN PERSON, WILL DEMONSTRATE THE WONDERS OF ELECTRIC COOKING AT

YOUR ELECTRICITY SHOWROOMS
MARKET STREET, BURY.

An advertisement used by the Bury Electricity Department

Consequently the officer responsible for publicity should endeavour to introduce a note of originality into his invitations and advertisements. An invitation should be made as personal as possible and above all should look interesting and as important as the cost of production will permit. It is advisable when sending out invitations in small numbers, for the name of the addressee to be *written* on the card; this method becomes impracticable when a large number of invitations have to be circularised.

An invitation card recently sent out from the Bury Corporation electricity showrooms made no reference whatsoever to "cooking demonstrations," although it was quite evident on reading the card to what it referred. The consumer was invited to spend a "pleasant afternoon" which was sufficient to make the necessary difference and create some slight curiosity and thus claim the attention of the consumer. On the reverse side of the card was space for the name and address of the consumer who was requested to fill it in and take the card along with her. This provided useful particulars for "following up."

From figures supplied by an experienced and well-known firm which periodically organises large-scale cooking demonstrations in connection with its commodity, it has been revealed that the average attendance is about 10 per cent. of the total number invited. The invitation card referred to was successful in bringing along approximately 30 per cent. of those invited.

While some difficulty may be experienced in evolving an original invitation card, much more scope is offered by the local Press. In nearly all local newspapers one page is usually set aside for advertising the town's entertainments for the coming week. This page can be usefully employed by the insertion of an advertisement similar to the one shown (left), which was published on the cinema page of the *Bury Times* (the leading local newspaper) a few weeks ago. Apart from the original layout of the advertisement, the little touch of humour rather intensifies its appeal. This page is probably read by more people than any other single page in the whole of the paper. Another point of interest is the reference to the showrooms as *YOUR* electricity showrooms, this is a title which is used in all publications and advertisements and has caused much favourable comment in the town. Many original ideas can be evolved on the lines of the cinema advertisement if only a little thought is given.

The showroom windows of an undertaking, especially if they are in a busy shopping thoroughfare, are undoubtedly worth hundreds of pounds in the course of a year, and can be used very profitably in connection with cooker development.

The two photographs reproduced below show a window display arranged in one of the showroom windows in Bury. The front of the window was covered with stiff black paper on which was the slogan, "Through the Looking Glass" and two E.D.A. "I'm Electric" figures. Holes were cut in the paper at varying heights, of sizes sufficient to allow an extensive view of the interior. The second photograph of the interior of the window shows the view which was obtained on looking through the apertures.

The window itself needs little, if any, explanation. Naturally, the left hand side, depicting the old coal range, was made to look as dirty and as unpleasant as possible. The range itself was taken from a local scrap yard and re-assembled in its rusty and filthy condition in the window; the cakes on this side of the display were charred and very unappetising. The right hand side of the window was, of course, made to give as vivid a contrast as possible and extolled the virtues of electric

A method of arousing curiosity employed in a showroom window

*Showroom sales superintendent, Bury Corporation Electricity Department.

Protection Against Lightning.

By N. V. Pestereff

Devices and methods

WHILE the origin of lightning is not yet completely understood, data has been accumulated, particularly in the United States, on the currents and voltages involved, and although information is still meagre it enables one to forecast the percentage of strokes in which any given values will be exceeded.

On 132-kV and lower-voltage systems, these values in all cases have been found to be greater than 132 kV and 6 kA. The minimum values in 60 per cent. of strokes are 264 kV and 20 kA; in 10 per cent. of the number they are 1,120 kV and 70 kA; and in 5 per cent. they are 1,450 kV and 90 kA. Apart from the magnitude of the voltage, the insulation is stressed by the rate of change of voltage. The worst condition likely to occur in practice is a vertical fronted wave requiring 40 microseconds to decrease to half its value.

Lightning surges may be caused by direct strokes to terminal apparatus, direct strokes to conductors near terminal apparatus and travelling waves. The only means of protection from direct strokes to the conductors or station is to prevent their occurrence by shielding. The usual method is an earth wire or wires above the line conductors for about half a mile out from the station. These will shield the conductors from direct strokes to an extent that is determined by the geometrical configuration of the system, earth wire, line conductor and cloud. For complete shielding two earth wires carried above and slightly outside the outermost conductor are necessary. This arrangement has been adopted in some of the most recently constructed high-voltage lines.

The application of various types of arrestors to transformers and generating plant is studied

Travelling waves may be caused by direct strokes to conductors or by induction due to lightning discharge near the conductors. In the latter case, prior to discharge, the cloud is at some potential positive or negative, to the earth mass. The conductors being located between the two will take up a static charge, the magnitude of which will depend on the height of the conductors above the ground and the voltage difference between the cloud and earth. When the cloud discharges, the charge held on the conductors manifests itself as a voltage to earth and proceeds outwards in each direction in the form of travelling waves of voltage.

Any change in the system conditions is accompanied by a transient which is usually oscillatory; the frequency of the oscillation is governed by the system inductance and capacitance to the point of change, the oscillations being superimposed on the normal frequency voltage wave. In general, switching surges cause voltage waves of comparatively long duration. If the voltage to earth exceeds about four times the normal, there is some evidence to indicate that the characteristics approximate to impulse conditions. Experience shows that 93 per cent. of all surges do not exceed four times the normal voltage to earth and that, therefore, in general the insulation characteristics are those of ordinary operation.

Protecting Transformers and Machines

Transformers and other static apparatus are considered to have an impulse ratio in the general order of not less than two to one. Due to the limitations of the dry-type insulation used, the insulation required to meet temperature and mechanical conditions, and space considerations, rotating machines should be considered to have an impulse ratio only slightly greater than unity. Thus when selecting protective equipment, it is safe to regard the crest value of one minute high-potential test voltage as the maximum value of impulse voltage which should be allowed on the coil or major insulation.

For the protection of transformers and the like, all that is required is to reduce the amplitude of the oncoming wave, but for rotating machinery the steepness of wave front must also be reduced, so that the resultant turn-to-turn voltage stress for a given turn length will not exceed the maximum allowable voltage stress on the insulation.

Rotating machines in general may be split up into two main groups: those connected directly to exposed overhead lines and those connected through transformers. In order to reduce the amplitude of the impulse wave in the first case two sets of line arrestors are recommended, one installed 2,000 ft. and the other 500 ft. from the machine. The farthest arrestors allow approximately 4 microseconds for operation before reflection from the capacitor reduces the incoming wave at the arrestor, and enables the surge impedance of the line between the arrestors and capacitor to be used to obtain the charging rate of the capacitor. The line arrestors 500 ft. out afford supplementary protection against the steeper wave fronts caused by direct strokes or surges originating within the 2,000 ft.

The function of the capacitor connected directly from line to ground on the busbars or at the machine terminals is to slope off the incoming wave to the permitted value. The higher the crest of the applied wave the higher will be the voltage to which the capacitor is charged and the greater the rate of charge (steepness of wave front) on the capacitor. It follows that placing in limitation on the applied wave is a matter of economics. Since the cost of capacitance increases approximately as the square of the voltage rating, the capacitance required should be kept as small as possible.

Hence for higher voltages it will be more economical to use capacitances of the order of 0.1 μF. (to prevent turn stress) in parallel with an arrestor which will limit the crest value of the entering wave. This type of protection can be used where no positive voltage reflection can occur at the neutral, such as is the case when the neutral resistance is equal to or less than the combined surge impedance of the winding, *i.e.*, with earthed-neutral machines.

Positive Voltage Reflection

The problem of protection for unearthed neutral or delta-connected machines is much more difficult as positive voltage reflection will occur. As machine windings may have a "time-length" equivalent to the distance at which the reflection point for the wave is removed from the point of voltage limitation, the entering wave must be held at the line terminal to one half the allowable machine impulse voltage. This can be done by inserting a sufficiently large capacitance between the machine terminals and ground. As such a capacitance (of the order of 0.5 μF) is expensive, the machine neutral should be earthed if this is possible.

When rotating electrical machinery is connected to exposed overhead lines through transformers, lightning impulses dangerous to the insulation may be transmitted through the transformers by both electrostatic and electromagnetic coupling, even when their high-voltage side is adequately protected by arrestors.

The lightning voltage transmitted by electrostatic coupling is influenced by the form of transformer construction, particularly the distribution of its windings on the core, by the capacitance of the low-voltage busbars, cables and other parts of the low-voltage circuit and by the characteristics of the rotating machines. The wide variations possible in these factors greatly affect these transmitted surges. In general the amplitude of the voltage electrostatically transmitted may be of the order of 25 per cent. of the lightning voltage permitted on the high-voltage side of the transformer.

The electromagnetic transfer depends on the turn ratio and short-circuit reactance and kVA of the transformer and on the bank connection and is not appreciably affected by the constants of the low-voltage circuit. For the general case, where the surge impedance of the primary circuit is negligible in comparison with the effective surge impedance of the secondary circuit, the ratio of crests of primary and secondary voltages is practically equal to the ratio of turns of the windings and where the "time-length" of a secondary circuit is short, voltage ratios in excess of the ratio of turns of the windings may result.

Developing the Cooker Load

(Concluded from previous page)

cooking. (It is only fair to state that the point of the display was not appreciated by everyone. One lady entered the showrooms and asked an assistant the price of the coal range in the window.)

A reference was made in the local Press to the window, which, being situated in the centre of the town, created much interest and, incidentally, quite considerable obstruction on the pavement.

Some reference should be made to the word "COOK-RITE" which is to be seen in the picture. This is the name coined by the Bury Corporation Electricity Department for the thermostatic control of the cooker oven. The chief features of this name are that it implies perfect cooking and avoids all approach to technicalities.

The development of the cooker load is a particularly important task, and it is a certainty that if progress is to be steady and certain, those who are in charge of publicity matters will have to "keep on their toes."

By far the greater proportion of the energy transmitted is by electromagnetic coupling and, as this is determinable from the rating plate data of the transformer, protection can be provided which will also be effective against the electrostatic component.

The steepness of wave front should be sloped off by a capacitance and while at first sight, due to the low voltage, it would appear to be economic to use a capacitance alone, an arrestor is essential, since resonance may otherwise occur between the transformer inductance and the capacitance.

Types of Arrestors

Arrestors for use alone or in conjunction with capacitors may be plain or expulsion gaps, or of the pellet or thyrite types. Plain gaps will limit by their spark-over the magnitude of the stress applied to the apparatus with which they are connected immediately in parallel. They cannot be considered as providing a practical solution for the following reasons:—(1) The spark-over of a gap usually results in an outage due to the power-frequency follow-on current. (2) The impulse-spark-over value of an air gap on increasingly steep-fronted waves rises much more rapidly than does the breakdown value of solid insulation for similar waves; consequently, small gap settings would be required to give protection against surges which would cause the gap to flash over in under 2/3 micro-seconds. With a gap small enough to give a practical margin of safety for each wave the spark-over value for long waves, such as those due to switching surges, would be frequently so low that the gap would frequently operate unjustifiably and result in unnecessary system outages. (3) Spark-over causes a drop in voltage which is so rapid that unless the value of the voltage at which the spark-over occurs is low the stresses on adjacent apparatus due to the voltage change may be greater than those for the initial wave.

The expulsion-type gap has been developed in an endeavour to overcome the main disadvantages of the plain gap—that operation is usually followed by power-frequency current. It consists essentially of two electrodes enclosed in a mechanically reinforced fibre tube vented at one end and so fixed to the supporting structure that a relatively short air gap is maintained between its free end and the line conductor. A surge of sufficient magnitude will cause breakdown of the internal and external air gaps; but if the normal-frequency voltage is sufficient to maintain the arc, the gas pressure generated in the tube will operate as in an expulsion fuse and interrupt the circuit. Any particular size of tube has current limits below which the generated pressure is insufficient for operation or above which the pressure generated may cause mechanical failure.

This type of arrestor overcomes, within its limits, only the difficulties due to the follow-on current and is thus suitable for protection of transmission lines, but not of apparatus and rotating machinery.

The pellet arrestor consists of a series spark gap and a valve element in the forms of a column of lead-peroxide pellets, each approximately $\frac{3}{32}$ in. in diameter with a thin porous coating of litharge. This column has the characteristic of being substantially an insulator at a low voltage but a conductor at a higher voltage. The electrical resistance is a function of the voltage only, decreasing (the current at the same time increasing) as the voltage is raised.

When the series gap arcs over, surge potential is applied to the pellet column and a current flows to earth. After the surge has been dissipated, the voltage falls to normal and the resistance of the pellet column increases until the few milliamperes flowing are interrupted by the series gap. This type of arrestor is suitable for most applications, but the impulse ratio (approximately 1.7) is higher than is usually desirable for protecting rotating machines.

Arrestors composed of thyrite, a dense stable, homogeneous, inorganic ceramic compound, are mechanically strong and their electrical resistance is again a function of the voltage only; the current increases 12.6 times each time the voltage is doubled and conforms to this law indefinitely. As thyrite has no inherent time lag, the series gap also should have no time lag. The latter is, therefore, composed of a series of small gaps in conjunction with small capacitances and high resistances. The resistances control the distribution of the power-frequency system voltage across the whole gap; but with lightning wave-fronts the capacity current becomes large compared with the resistance current and controls the voltage distribution across the gaps. Under these conditions the capacity currents through the gaps at the line end are large compared with those at the earth end; this causes a concentration of impulse potential at the line end, which produces successive breakdown of the gaps, beginning at the line end and resulting in the desired low impulse-spark potential.

Recommendations

The impulse ratio of these arrestors is very nearly unity, but their cost limits their use to essential positions, and the following recommendations are therefore made:—

MACHINE CONNECTION.	PROTECTIVE EQUIPMENT.
Direct to overhead lines with neutral point earth.	Pellet arrestors 2,000 ft. and 500 ft. out and capacitor connected from machine terminals to earth, shunted by thyrite arrestor at voltages above 11 kV.
Direct to overhead lines with insulated or no neutral, i.e., delta winding; this should be avoided if possible.	Pellet arrestors as above and large-capacity condensers.
Through transformer to overhead line with insulated neutral; this should be avoided if possible.	Pellet arrestor protecting high-voltage side of transformer, capacitor at machine terminals shunted by thyrite arrestor.
Through transformer to overhead line with neutral point earthed.	Do.

The resistance of the earth connection of any arrestor should not exceed 5 ohms, while the earth connection of the capacitor, shunting arrestor and machine earth should be interconnected to obtain an intimate relationship. If the machines are connected to the exposed line through cables, the line arrestors should be situated on the exposed line at the recommended distance from the cable-line junction.

The total yearly cost of the preventive measures adopted in any specific case should be less than the yearly saving obtained through their use due to the decrease in the number of outages or of outage time. Where continuity of supply is essential the outlay for protection is relatively negligible. In many instances, however, short interruptions are not of vital importance and it would be of great assistance if readers could give some figures as to the cost in loss of revenue and repair cost per outage hour.

Indian Electrical Notes. (By a Correspondent in Bombay)

ACCORDING to the report of the Madras Electricity Department, at the present rate of progress the whole of the Presidency will have been organised on a sound and economic basis in the matter of electricity supply within the next two or three years. The Pykara hydro-electric system has completed its fourth year of operation, the growth of demand having continued to be most satisfactory. A scheme costing Rs.45 lakhs and providing for additional capacity was undertaken during the year and is now nearing completion. The financial success of the system has been mainly due to the enterprise of the Coimbatore industrialists and of the working of double shifts in textile mills. The agricultural load is also developing steadily and nearly 90 villages now have supplies.

With regard to the Mettur system, work was so expedited that the whole system is now being put into operation. Load prospects are considered as favourable. Construction work on the Vizagapatam and Bezwada thermal schemes for meeting the power needs of the Andhra district is progressing and it is anticipated that operation will be started next March.

The total output of energy in the Presidency during the past year was 136 million kWh, of which Pykara produced 76 million kWh. There are a number of new schemes under investigation on which some action is expected to be taken during the current year. The committee appointed by the Madras Government to investigate the Papanasam hydro-electric project has reported that the scheme, if undertaken, will ultimately cost Rs.2 crores and will be highly remunerative. It is understood that the present Congress Ministry is keen on starting the work without delay. A report on the Lammasingi scheme may be ready by the end of the year, and also one on the thermal schemes for the Ceded Districts. The extension of the Pykara power to the West Coast will be further investigated and a scheme prepared if considered practicable. The capital expenditure on construction in the current year is expected to reach Rs.120 lakhs.

As regards the policy to be adopted for the generation and distribution of electricity, the Government has accepted for the present the following recommendations of the Electricity Committee:—(1) That the generation of electricity and its transmission and supply in bulk should be by State agency throughout the Presidency. (2) That local bodies should be preferred to private companies as licensees for the distribution of electricity and for the generation of power also in those areas which are not likely to be served by stations belonging to Government. (3) That Government should ordinarily undertake retail distribution of electricity in rural areas.

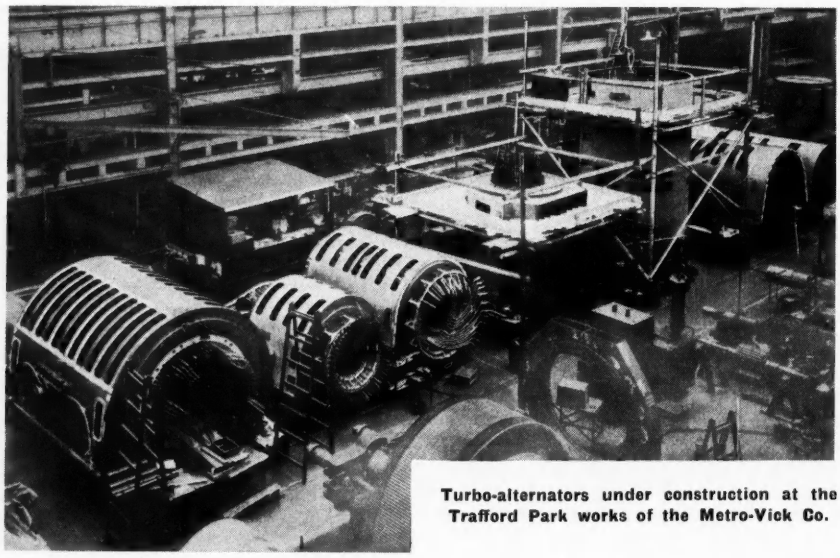
It is highly gratifying to find that the Punjab Government has now sanctioned the second stage of the construction of the Uhl hydro-electric scheme, work on which will be started without delay. This stage of the scheme is designed to take the water that has already gone through the turbines at Jogendranagar and utilise it again through another set of turbines at a point having a vertical drop of 1,200 ft., where a further 48,000 kW can be developed.

Electrical Manufacturers' Activities

A review of the past year's principal achievements and work now going through the shops

Metropolitan-Vickers

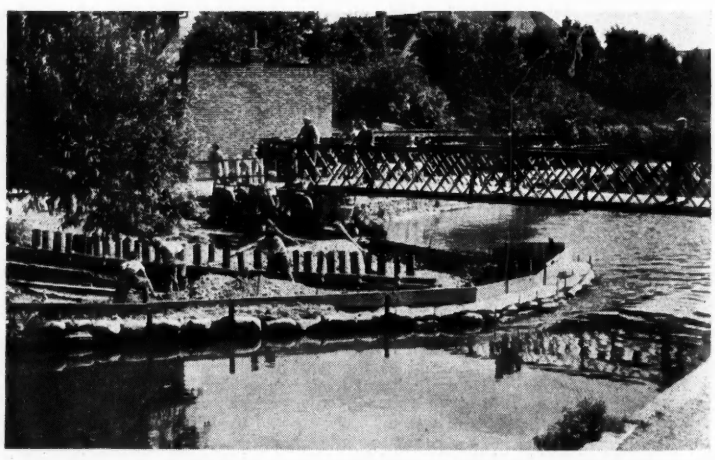
PROBABLY the most spectacular order under execution by the Metropolitan-Vickers Electrical Co., Ltd., is that for the 100,000-kW turbo-alternator that will inaugurate the second half of the Battersea power station (London Power Co.); this is a superimposed set, the h.p. end of which is being designed for steam conditions of 1,350 lb. per sq. in. and 950 deg. F. in accordance with particulars that have already appeared in the ELECTRICAL REVIEW. Although smaller in output a superimposed set of 50,000 kW for the North Met. Co. (Brimsdown A) competes with it in interest; this receives steam at 1,900 per sq. in. and 930 deg. and the stator of the alternator is wound for 33 kV.



Turbo-alternators under construction at the Trafford Park works of the Metro-Vick Co.

Four further 33,000-kW machines for the Klip generating station of the Victoria Falls and Transvaal Power Co., a 30,000-kW unit for Clyde's Mill and another for Yoker (both Clyde Valley Co.), and one of 30,750 kW for Manchester, are among the larger examples of heavy engineering going through the works, but they are outnumbered by those of smaller capacity that are being built, mainly for export. The latter include many self-contained turbo-generator and pass-out sets of round about 3,000 kW.

The Victoria Falls Co. continues to order 20,000-kVA synchronous condensers with its transformers. Synchronous-induction motors under construction include three 1,600-h.p. motors for driving pumps. A large number of a.c. and also d.c. winder motors with Ward-Leonard generators have been ordered for home and abroad, some of which are for the replacement of steam drives.



Damming the River Fray (Uxbridge) for the excavation of the bed to accommodate ducts for Callender cable

Of the large three-phase transformers in course of manufacture, mention may be made of units of 62,500-kVA, 11/33-kV ON/OFB for Blackburn Meadows, 37,500 kVA for Belfast (naturally cooled), 40,000 kVA for linking up the 33-kV and 11-kV systems at Sheffield, and 45,000 and 30,000 kVA at 132 kV for the C.E.B. One of two 12,500-kVA, 11/110-kV transformers ordered is to be impulse tested, facilities for which up to two million kVA are available. The majority of large and medium-sized sub-station transformers are provided with on-load tap-changing gear.

Arc suppression coils are being built for high-voltage systems. Another development is decoupling coils for balancing the mutual capacitance between 132- and 33-kV lines mounted on the same poles.

Small distribution transformers are being designed for filling with non-inflammable oil. Gas bubble (Buchholz) relays for transformer protection are being made in the Meter Department. Among the instrument transformers in production are several capacity shielded types up to 132 kV, some of which are intended for small supplies of low-voltage power.

A noteworthy feature of the switchgear development is the extension of the range of single-break metal-clad units, which are being manufactured for 33- and 66-kV with rupturing capacities up to 1,500,000 kVA. Some of the 66-kV breakers are destined for the London Power Co.'s sub-stations. Others at 33 kV are in hand for the power stations at Brighton, Bradford and Stretford, and fifty for Johannesburg. A large order for 6.6-kV gear is that of fifty-two units for a new switch-house at Halifax. Extensions to the grid and existing power stations are causing considerable activity; orders for the C.E.B. include oil-blast high-speed 1,500,000-kVA breakers and high-speed relays to give contact separation within 0.05 sec. on breakers ranging from 33 to 132 kV. It is becoming common to have several high-voltage feeders with a bus section equipment in one steel sub-station, sometimes controlled from panels situated at a distance. There has been an increased demand for spring-closing outdoor breakers. Control equipments are in demand for industrial installations (including high-frequency furnaces and rolling mills) as well as for public-supply systems. Allied to this activity is the supervisory control and indicating equipment for the Dutch Railways. Work is in hand for the protection of busbars at Brighton, Stoke and Fulham stations on the Translay system. Relays provide many items of interest, especially those for the correct charging of batteries from rectifiers and for securing accurate time intervals.

In the heavy industrial field large reversing mill drives with automatic control of peaks furnish good examples of engineering, such as the 3,000-kW Ilgner equipment ordered by the South Durham Steel & Iron Co. and several comparable units for home and abroad. Another development is the individual drive of live rolls in steel works. The market for the company's small and medium-size motors shows no signs of contracting.

Although the large contracts for the Polish State Railways

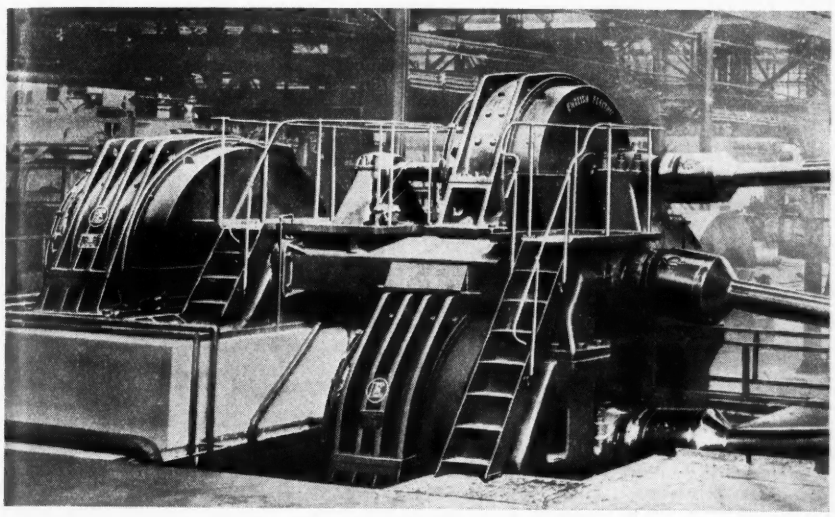
and the Central Brazil Railway (first section) as well as for Metadyne units for the L.P.T.B. are completed, there is still much to see in the traction department, including work on forty-two locomotives for the South African Railways, trolley bus and tramcar equipments and battery vehicles of from 7 to 22 cwt.

Mercury-vapour lamps of normal, colour-corrected fluorescent and horizontal types, the 125-W ultra-violet lamp and the use of krypton gas for miners' bulbs are the chief developments of the Cosmos Lamp Works.

In the research department great promise is offered by the investigations being carried out on molybdenum vanadium steels in respect of their creep resistance; the same applies to tests on large flameproof enclosures. Insulation, X-ray crystallography, magnetic crack detection and acoustics are also among the most fruitful lines of research in process.

Callender's

Typical of the work being carried out by cable manufacturers is the twelve miles of 66-kV underground feeder from Willesden power station (Metropolitan Co.) to Uxbridge which has involved the tunnelling of rivers and roads, the damming of one large stream for excavating the bed and the construction of a bridge over another. This feeder consists of three non-armoured single-core cables protected by reinforced concrete covers; ten types of joints were used. It is accompanied by telephone and pilot cables and provision is made for ducts for further cables later.



An English electric reversing mill drive without pinion housings; two 2,030-h.p. main-roll motors and one 450-h.p. vertical-roll motor

Two extensions to the grid are in hand. One of 27 miles is from Runcorn to Birkenhead and the other, 28 miles, is from Leicester to Corby. Aircraft cables are being made for British and foreign Governments; a De Havilland "Albatross" requires 4,000 ft. and an Empire flying boat 1¼ miles of cable. Of the use of cables at sea, H.M.S. *Glasgow* and the P. & O. liners *Stratheden* and *Strathallan* provide good examples, the liners taking 1,200 yards of 0.75 sq. in. cable each for their ring mains, while the New Zealand vessel *Awatee* uses 44 miles in all.

The largest interlocking railway signal installation in Great Britain at Bristol, which requires some 200 miles, provides a good illustration of low-voltage work at home which is supplemented by the work involved in carrying out a number of contracts in India and the Dominions. Floodlighting for the Coronation called for a good deal of cable, of which Alton Towers, Staffs, furnishes a representative example; here 3,700 yd. was installed inside and 8,000 yd. outside the building. The most interesting product of research was probably the 200-kV impregnated gas-pressure cable which was recently described in our columns.

English Electric Co.

All departments of the English Electric Co., Ltd., are actively engaged in fulfilling contracts for both home and overseas markets. This is reflected, for example, in the number of contracts entered into for turbo-alternators up to 45,000 kVA at 3,000 r.p.m. The transformer department is exceptionally busy in the construction of units of from 45,000 kVA for the Central Electricity Board to small sizes for the rural distribution systems of supply undertakings.

In the switchgear field important contracts in hand include a twenty-panel, 350,000-kVA rupturing capacity metal-clad switchboard for Australia; a fourteen-panel, 1,000,000-kVA metal-clad switchboard for a large municipal power station, and the complete equipment, comprising nearly forty switch units with kiosks, transformers and low-voltage switchgear for a supply network in the West of England. A considerable amount of electrical equipment is in hand for the iron and steel industry, ranging from small roller motors to large reversing mill drives.

In addition to the running contract for traction equipment for the Southern Railway, other important orders include one from the London, Midland & Scottish Railway for the re-equipping of the Liverpool-Southport electrified lines. For the New Zealand Government Railways a number of main-line express locomotives and six complete trains, each consisting of motor and trailer coaches for suburban traffic, are in course of construction, particulars of which appeared in our last issue. For the Ceylon Government Railways the company has in hand three four-coach articulated Diesel-electric trains.

Work is also proceeding on a contract for ninety-nine rail cars for the Buenos Aires Great Southern and Buenos Aires Western Railways. This order is said to be the largest so far placed in this country for vehicles of this type. Orders continue to be received for A.E.C.-English Electric trolley-buses and also for bus and coach bodies of the all-metal and composite reinforced type.

A large number of internal-combustion engines with generators ranging in size from 250 b.h.p. Diesels to 3,500 b.h.p. Fullagar engines are under construction for both home and overseas markets. Among the orders received by the Hydro-Electric Department is one for five further 10,000-h.p. horizontal impulse turbines and d.c. generators for the Lochaber power station of the British Aluminium Co., bringing its capacity up to 100,000 h.p.

On the lighter engineering side there is also a brisk demand for industrial motors and control gear, fusegear, house service meters and domestic electrical appliances. Existing facilities for research will shortly be augmented by a new switchgear testing station and laboratories.

General Electric Co.

Works extensions to cope with a growth of manufacturing and experimental requirements are reported by the General Electric Co., Ltd. Prime movers in hand include a duplicate 31,000-kVA G.E.C.-Fraser & Chalmers turbo-alternator for Johannesburg the alternator of which, like those for the 37,500-kVA sets ordered for Woolwich, Stockport, Stepney and Darlington, is wound for 22 kV. Many general turbo-generators are under construction for paper and textile mills, several being for export. A new blading and improved governors have been introduced.

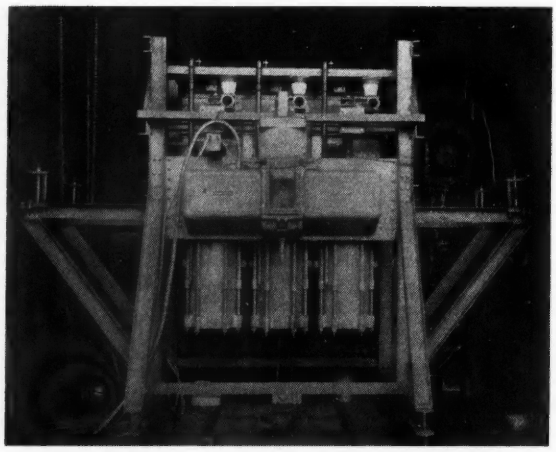
Air-cooled as well as water-cooled rectifiers, with or without grid control, are being built in large numbers, many of which are for foreign countries and the Dominions. Big orders have been received for 5- to 150-h.p. d.c. motors for steelworks, and for low-frequency a.c. motors for the direct driving of live rollers.

Condenser bushing bus-bars are now being used for 11 and 6.6 kV, as well as for 33 kV and metal-clad switchgear under construction, and spring-closing mechanism is being applied to circuit-breakers with capacities of from 75,000 to 500,000 kVA. The 6.6-kV, 1,000,000-kVA breakers for Norwich have withstood a peak short-circuit working current of 266,000 A under test.

Outdoor switchgear is well represented by a large number of 33-kV units being supplied to the Madras Government, and by 60-kVA, 500,000-kVA circuit-breakers with the three phases in a single tank. Auto-fuse isolators for 11-kV pole-mounting rotary isolating switches for 660 V and solenoid-operated industrial breakers are other examples of what is being asked for by supply undertakings.

The largest transformer being built is one of 45,000 kVA

32/33-kV for the grid; next come 20,000-kVA and 15,000 kVA 33/11-kV sets for Birmingham and a similar 15,000 kVA unit for Cardiff. There are also half a dozen transformers, ranging from 7,500 to 15,000 kVA, in hand for Palestine, and a 4,000-kVA 6.6 kV/230-V unit for an arc furnace in Canada. For the grid there are also three single-phase oil-immersed reactors (10 per cent. reactance). Unusual productions of the



One of the 1,000,000-kVA 6,600-V G.E.C. metalclad oil circuit-breakers for Norwich Corporation on test at Witton

furnace department are the two 60-kW crematorium installations now in hand.

Contracts for industrial electrification are typified by the hot and cold strip and tinplate mill of Richard Thomas & Co., Ltd., at Ebbw Vale, embodying a 3,500-kW synchronous Ward-Leonard set, d.c. motors and switchgear; most of the mechanical plant for cold rolling is being constructed at the Fraser & Chalmers works. Lighter plant is represented by d.c. and a.c. welding sets of which a large number is passing through the shops.

Work for London Transport includes 812 motors of 172 h.p. with small overall height, and six battery locomotives and trolley-bus equipments. Trolley-bus equipments, to the number of seventy, are also being manufactured for Canton, together with pumpless air-cooled rectifiers, switchgear, transformers and cables. Marine electrification may be illustrated by three 1,060-kW turbo-generators, fans, motors and control gear for the new R.M.S. liner *Andes*.

Newcomers among discharge lamps include a 400-W "Osira" lamp with luminescent bulb for colour correction, a 500-W projector lamp with parabolic reflector for aerodrome floodlighting and an 85-W sodium lamp in the form of a U-tube that can be removed from its Dewar jacket and horizontally burning "Osira" lamps without magnetic deflectors.

Important cable contracts in hand by the Pirelli-General and the Siemens and General Electric Railway Signal Co., are for 348 miles of single-core 33-kV cable for the Southern Railway, and over twelve miles of 66-kV three-core oil-filled cable for the C.E.B. A carrier system employing equipment, produced at the new telephone cable works at Eastleigh, is to be installed on a concentric submarine cable between Nevin in Wales and Howth, near Dublin.

Yarrow & Co., Ltd.

Although the contract for the six 200,000 lb. per sq. in. boilers for Dalmarnock has been completed, the land boiler section of Yarrow & Co., Ltd., has been fully occupied lately. Typical examples are eight boilers (half of an order for sixteen) for the Greenwich power station of the London Passenger Transport Board, and one for W. H. Allen, Sons & Co., for testing steam conditions of 600 lb. per sq. in. and 800 deg. F.

Repeat orders are in hand for a boiler for Londonderry generating station, and for the Vereeniging pumping station of the Rand Water Board, South Africa, two for Bulawayo, and one for an industrial concern in Newburgh. Designs have been supplied for two further boilers to be constructed under licence for Helsingfors power station, Finland.

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

Hope Further Deferred?

I was very surprised to note the short article under the heading of "Hope Deferred" which appeared on page 880 of your current issue, and cannot think how the inaccurate statement to the effect that the Prime Minister said that he was hoping that the Bill would be *passed* in the current session came to be made. The actual statement in "Hansard" for Thursday, December 16th, a copy of which I have in front of me, is as follows:—"The Prime Minister: I am hoping that it will be possible to introduce it in the current session."

I think you will agree that the statement as printed by you is quite incorrect, and I should therefore be greatly obliged if you could have this corrected in your next issue, particularly in view of certain information from a most reliable source which has come to my knowledge to the effect that it is quite within the bounds of possibility, due to the opposition which the Minister of Transport is now meeting with, not only from the Smaller Authorities but also from numerous other bodies both company and municipal, that the Bill may not even be introduced during the next session, and is certainly most unlikely to be passed into law.

You will, I feel sure, appreciate the significance of the very guarded statement which was actually made by the Prime Minister.

A. J. C. DERENZI.

Newcastle, Staffs, *December 28th.*

Hon. Secretary,
The Committee of Smaller Municipal Electricity Supply Undertakings.

[Mr. DeRenzi is right: "Hansard" certainly says "introduced." But if our reporter was incorrect in using the word "passed" so was the Press in general.—EDS. ELEC. REV.]

Motor-starting Regulations

Our attention has been called to the letter under the above heading in your issue of December 24th.

While we agree in general about the severity of starting regulations, we cannot understand the paragraph: "Conditions as regards single-phase motors are even worse; in fact, they are so bad in certain London districts that several of the most reputable manufacturers refuse to quote for motors if they are intended for installation in these districts."

Surely it is only a question of the manufacturer designing the correct type of machine to comply with the regulations. Hand-operated or push-button controlled motor starting gear can be supplied to comply with the most severe regulations and capable of dealing with practically any starting load.

Huddersfield, *December 24th.* BROOK MOTORS, LTD.
John L. Brook,

A Three-phase Phenomenon

I was interested to read Mr. Gallop's letter in your issue of December 17th on voltage displacement experienced on his system. I would suggest that this is, in all probability, a case of neutral inversion. This, in brief, is a distortion of the normal three-phase symmetrical voltage vector diagram with the three voltages equally disposed in time phase and the neutral point lying at the geometrical centre of the triangle. The symmetrical condition is only obtained when all the admittances between line and neutral are equal, and in the case quoted by Mr. Gallop, when one phase is disconnected on the delta side of the transformer a large displacement of the neutral from its balanced position might occur.

Your correspondent does not state whether the transformer in question is earthed direct or through an auxiliary device, such as a current-limiting resistance or reactor or a Petersen coil. It is possible that by altering the characteristics of the earth connection a cure for the trouble could be found. It seems evident that the voltage rise in this instance is of considerable magnitude and may dangerously stress the system insulation.

A comprehensive account of neutral inversion was given by Mr. B. G. Gates, in the I.E.E. *Journal* for March, 1936, in which he developed formulæ for ascertaining the position of a displaced neutral under various conditions.

J. C. G. BELL,
District Engineer,
Antrim Electricity Distribution Co., Ltd.
Ballyclare, Co. Antrim, *December 22nd.*

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

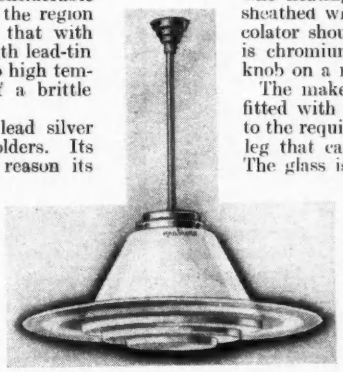
A High-temperature Solder

There are now many applications in which soldered joints are required to resist high temperatures. The lead-tin solders with a melting point of 183 deg. C. lose a considerable amount of their strength at temperatures in the region of 150 deg. Experiments have shown also that with certain metals, such as copper, joints made with lead-tin solders become weak on prolonged exposure to high temperature owing to the continued growth of a brittle copper tin layer.

For many high temperature applications lead silver solder has an advantage over the lead-tin solders. Its melting point is 305 deg. C. and for this reason its strength at 150 deg. C. is greater than that of lead-tin solders which melt at 183 deg. C., and, since it is tin-free, the active risks of embrittlement are eliminated.

Apart from special radiator work, this alloy should be of assistance in ordinary soldering where the soldered joints may be subjected to high-temperature conditions, such as in connection with geysers and hot water appliances, armatures, commutators, etc.

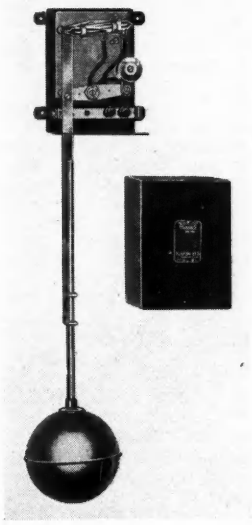
This new solder is a product of FRY'S METAL FOUNDRIES, LTD., Tandem Works, Merton Abbey, London, S.W.19.



A new Hailwood & Ackroyd fitting of unusual shape

Float Switch

A sensitive type of float switch with drip-proof cover has been introduced by KLAXON, LTD., 36, Blandford St., W.1. It can be supplied in single-, double- or triple-pole forms for either 5 or 15 A. A copper float on an adjustable brass rod is supplied and the contacts can be arranged to open and close with a rise and fall of water level of less than half an inch.



Single-pole float switch with drip-proof cover removed

Radiator Covers and Grilles

Many new designs are included in the latest catalogue of radiator covers, ventilating panels and grilles by G. A. HARVEY & CO., LTD., Greenwich Metal Works, London, S.E.7. These are of perforated metal which, produced from the solid sheet, combines strength and durability with decorative effect, and can be supplied in a large number of designs in steel, brass, copper, bronze, aluminium, stainless steel and various other metals. It is possible to select a design that will harmonise with any style or period of architecture. The metal can be finished in various styles, including oxidised silver, copper, brass and nickel, either bright or matt, antique brass, copper and bronze, or stove enamel.

Small Domestic Appliances

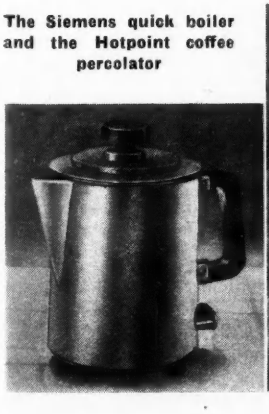
New equipment introduced lately by the HOTPOINT ELECTRIC APPLIANCE CO., LTD., 24, Newman Street, London, W.1, includes a coffee percolator and an illuminated make-up mirror.

The former has a capacity for six cupsful of coffee, taking from fifteen to twenty minutes for a complete percolation. The heating element is rated at 400-W and is of the sheathed wire type, a fused plug disconnecting the percolator should it be switched on when dry. The finish is chromium plate, with a heat insulated handle and knob on a removable lid, and a dripless spout.

The make-up mirror is available both as a wall type fitted with a ball-hinged joint, so that it may be tilted to the required angle, and as a table model with a hinged leg that can be turned right over to act as a hanger. The glass is in a chromium-plated frame, and the concealed lamp provides sufficient heat to prevent steaming.

SIEMENS-SCHUCKERT, Berlin, have introduced a quick-boiling hot-water jug with an initial loading of 1,700-W, but so designed that after boiling point has been attained the loading is reduced to 500 W. The normal operating loading is 1,200 W.

The Siemens quick boiler and the Hotpoint coffee percolator

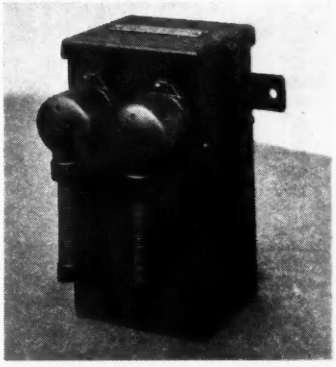


Lighting Fittings

The new catalogue recently issued by HAILWOOD & ACKROYD, LTD., Morley, Leeds, contains several new designs, and we have chosen No. DP444, illustrated on the left, as a typical example of this modern range.

A Low-voltage Transformer

Designed especially for garages, factories and temporary lighting installations, where portable lighting equipment is in use, the new low-voltage transformer of the FOSTER ENGINEERING CO., LTD., Apex Works, South Wimbledon, London, S.W.19, is suitable for wall mounting and is housed in a sheet-steel case filled with petroleum jelly.



The Foster low-voltage transformer

The transformer is of the double-winding type, the primary being wound for 210, 230 and 250 V and the secondary for 15, 25 and 50 V. Outputs of 25, 50, 75, 100, 250, 500 and 750 VA are standard, although larger outputs can be provided. One pattern is fitted with a metal-clad outlet plug up to 100 VA, as shown in the illustration, and another with internal low-voltage terminals and conduit outlet, it being assumed that the larger transformers will be used in a fixed position, remote from the lamps.

The terminals are arranged so that the high- and low-voltage connections cannot be confused, and conduit entry is provided for the incoming supply to a clearly marked insulated terminal block.

Immersion Heaters for Film Tanks

An immersion heater developed recently by KODAK, LTD., Kingsway, London, W.C.2, is of a special design. Three models are available. The 250-W heater will raise the contents of the dental tank 10 deg. F. in 5 min.; the 500-W heater will raise the temperature of No. 122 tank 10 deg. F. in 7½ min.; and the 750-W heater will raise the No. 2 tank 10 deg. F. in 6¾ min.

Each model is available in three voltage ranges: 100-120 (supplied to special order only), 200-220 and 230-250. All the heaters are of such a length that when used in their appropriate tanks immersion up to the handle is impossible. The heating element is of nichrome wire tightly embedded in crystalline magnesium oxide within a non-corrodible metal tube. The moulded bakelite handle is heat-insulated from the heater itself. All screws and nuts are of nickelled brass and are sunk

A Kodak immersion heater

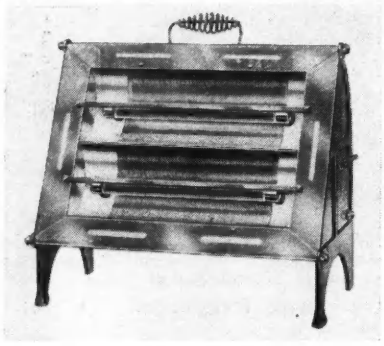
so that it is impossible for the hand to touch any metal when gripping the handle.

A screwed brass clamp which fits into a recess inside the handle makes it impossible to pull on the terminal wires and connections. The flex is best-quality three-core c.t.s., without a connector. The end of the brown earth wire has attached to it a permanent tag marked "earth," and the handle bears the wording "Brown to be connected to earth."

The tubing is of Firth's stainless steel, incorrodible in both developing and acid hypo. solutions. It is drawn, not welded, so that leakage and porosity are out of the question. The 750-W heater stands up on its own base in the professional film tank, and the 250- and 500-W heaters have the upright tubes bent in such a way that in their appropriate tanks they also will stand upright without support.

A Reflector Fire

The "Specular" fire, a new product of the MANOR ELECTRIC OVEN & FIRE CO., LTD., 175, Windsor House, Victoria Street, London, S.W.1, incorporates a lamp by means of which the reflectors retain the glowing effect of the fire-bars when they are not in use.



The Manor "Specular" fire

The fire is constructed with cast-iron ends, a sheet steel back and polished non-rusting metal frame and reflectors. Each fire-bar is controlled by an independent foot switch and the lamps are operated from the wall socket. The measurements are 13¼ in. high by 15½ in. wide by 8 in. deep and two rod type elements of either 750 or 1,000 W are fitted. Sprayed gold is the standard finish.

An Electric Tar Heater

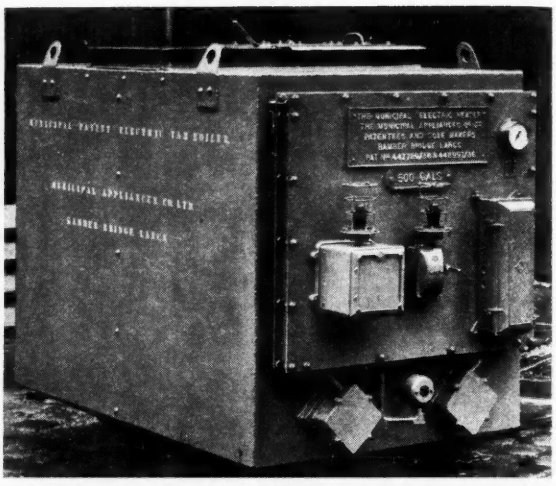
The heating of tar and bitumen by electricity offers a useful off-peak load to the supply company as, with an efficiently lagged boiler, there is no need for heat to be applied during the daytime. Very low tariffs can thus be obtained and for one installation at least there is a flat rate of ¼d. per kWh, thus cutting the operating cost to one-third of that of steam or coke. In addition the accurate control of temperature eliminates the wasting of material through overheating and the evaporation of the natural oils.

The tar and bitumen tank made by the MUNICIPAL APPLIANCES CO., LTD., Hecla Works, Bamber Bridge, Preston, is fitted with "Chromalox" strip elements forming a heater of special design. The elements are housed in ducts of square section which are set diagonally across the tank and do not interfere with the cleaning of the tank bottom. When heating bitumen it is advisable to have a mixing action, and to accomplish this cross tubes are fitted at 2½ in. centres throughout the length of each circulating duct.

The elements are arranged in three or four sets per duct and "star" connected, each being separately fused and the whole controlled through a thermostat operating a contactor. The loading may range from 7 kW to 76½ kW, dependent upon the size, temperature rise required and the length of off-peak heating period. A time-switch makes operation of the boiler automatic and a night watchman unnecessary.

The distribution board contains the main and auxiliary indicating type neon fuses, the main circuit providing the initial heating and the auxiliary circuit maintaining the temperature. A triple-pole change-over switch is provided and pilot lamps on each circuit indicate which supply is in use. For completely automatic operation a second thermostat and contactor can replace the manual change-over switch.

The tanks can be supplied with rotary discharge pumps with either hot air, steam or electrically heated jackets and can be direct coupled to a motor or fitted with pulleys.



An electrically heated tar and bitumen tank

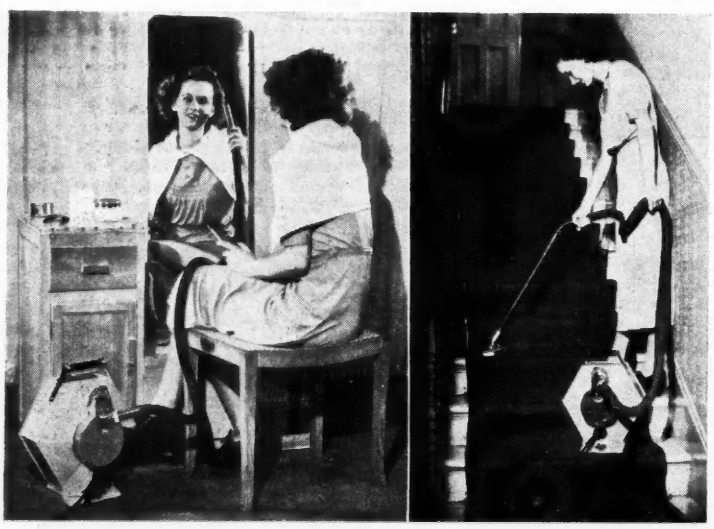
Lagging may be carried out on site with 85 per cent. magnesia plaster and non-conducting composition, and the capacities available range from 100 to 5,000 gal.

Thermal Insulation

Aluminium foil as a heat insulator is available in three forms from the ARDOR ENGINEERING CO., LTD., Arterial Road, St. Mary Cray, Kent. The Ardor thermal sheet, which can be used for either straight or curved surfaces, is a combination of two thin sheets, one of which has been corrugated to a depth of ¼ in. The ridges of the corrugations being against the surface to be insulated, an equivalent amount of air space is left between the latter and the outer plain sheet which has a high reflectivity and low emissivity value. The thermal conductivity of the thermal sheet is given as 0.2 B.th.u. per sq. ft. per hr. per in. thickness at 50 deg. mean temperature. Convection losses are reduced by placing the corrugations horizontally wherever possible. Ardor insulating slab consists of the thermal sheet built up in several layers with the ribs encased in a frame of thicker gauge foil. Slabs are made to the nearest ¼-in. thickness up to 6 in. Standard sizes are 4 ft. by 2 ft., 3 ft. by 2 ft. and 3 ft. by 1 ft. 6 in., but dimensions can be varied to suit requirements.

A Combined Cleaner and Heater

Although it weighs only 17 lb. and measures 15 in. by 13 in. by 9½ in. an ingenious apparatus, supplied by the ELECTRONAIRE MARKETING CO., LTD., 300/304, Gray's Inn Road, London, W.C.1, can be used with equal efficiency as a vacuum cleaner, air warmer or steriliser.



The "Electronaire" combined cleaner and air warmer

The body of the machine is hexagonal and is finished in black or cream with chromium fittings, a black handle being provided at the top of the apparatus. A ⅛-h.p. motor is incorporated. An especially attractive feature is that no dust bag is required, emptying being done simply by undoing a screw which releases a flap at the base. The dust container has a capacity of over 200 cu. in. By means of a socket arrangement it is impossible for the cleaner and hot-air attachments to come off accidentally or to be transposed.

All air passing out of the machine is sterilised by a pad moistened with a suitable disinfectant, and a container is provided for demothing crystals if required. A 350-W heating element warming the air emitted to 120-130 deg. F. adds to the usefulness of the apparatus by enabling it to be used as a hair dryer, bed warmer, and to a certain extent as a portable air conditioner. Separate switches at the front of the machine control the motor and the heater.

A full set of attachments for cleaning cars, stairs, furniture, curtains, &c., is supplied with each of the machines, which are obtainable through dealers only. The equipment normally stands upright on a pedestal, but is provided with skids upon which it rests when in use as a vacuum cleaner.

New Books

Physics for Students of Applied Science. By J. E. SHRADER. Pp. 638; figs. 581. London: McGraw-Hill Publishing Co., Ltd. Price 24s.

This book covers the ground required for the Intermediate Science standard and goes a little beyond it. It is divided into six main sections headed: Mechanics, Heat, Electricity, Wave Motion, Sound and Light. The section on wave motion is an innovation in a book of this type and a welcome one. Apart from this the book brings the material usually dealt with in lecture courses to junior students. This is as it should be. A text book must not be too original or it will not serve its purpose. The syllabus for the more elementary subjects has become fairly well standardised in all colleges and so it is inevitable that many textbooks bring much the same material.

The chief requirements are that the matter shall be well arranged, well illustrated with examples which should be drawn from practical work, presented with clarity, and that all examples of the application of fundamental principles be up to date. The requirements are all met in this book, which will consequently serve both teachers and students admirably. The work is so well done that there is but little room for criticism. We would, however, prefer to see vector quantities distinguished from scalar ones. It is difficult at all times to get students to handle vectors correctly and the task is made a little easier if some distinctive symbol is used such as is called for by the B.S.I.

One innovation we would like to have seen is in the presentation of electrostatic and electromagnetic quantities. In this, as in all other elementary text books, these are kept so carefully apart that the equivalence between them does not become apparent to the student. Hence he learns later than need be that electric quantity is the equivalent of magnetic mass and electric field gradient the equivalent of magnetic induction. Nor does he learn at the proper time that owing to the conventions adopted electrostatic flux is *not* strictly the equivalent of magnetic flux nor electric flux density (D) the equivalent of magnetic flux density (B), but that the factor 4π must be introduced to make them equivalent. Perhaps an elementary textbook will be written some day which will make all this evident to the beginner; he will then be saved a good deal of trouble when he gets on to more advanced work. But perhaps our teachers have become so used to skating over the weaknesses in our system of units and nomenclature that a book which exposed these weaknesses would be disconcerting. It only remains to be said that this book is well produced and can be thoroughly recommended.

The World of Atoms. By A. HAAS. (Second edition.) Pp. 183; figs. 54. London: Chapman & Hall, Ltd. Price 10s. 6d.

The first edition of this book, which was based on a course of lectures given by the author in 1926, was published in 1928. Since then many fundamental discoveries have been made in atomic physics, and accounts of most of these have been incorporated in the new edition. The old and new material have been blended satisfactorily and there are few omissions of significance. It is probably now the best semi-popular treatise of its kind and its standard is such that it could be read with little difficulty by a student of engineering in his first year at a university. Of the twelve sections the first eight are primarily on aspects of atoms and radiation which are by now almost classical. Their scope is roughly the whole of what is often called modern physics, excluding wave-mechanics and recent work on the controlled disruption of nuclei. Quite a number of important results which are often overlooked are mentioned, such as the separation in considerable quantity of the isotopes of neon, Chadwick's determination of the atomic number, and the relatively early recognition by band spectroscopists of the existence of isotopes of some light elements. The ninth, tenth and eleventh sections deal with more recent researches on nuclear phenomena and cosmic rays. They cover ground little different from that of Rutherford's "The Newer Alchemy," and are well up to the high standard of the earlier chapters. The last chapter, on wave-mechanics, appears on the other hand to be shorter than is necessary to give a reader without previous knowledge of the subject an adequate idea of it. However, Professor Haas's instinct here may be sound, as it is becoming increasingly evident that wave-mechanics is far from the last word in fundamental theory. In any event, anyone requiring more information can obtain it easily from C. G. Darwin's book.

The printing is good and the figures well chosen. Some of the latter suffer, however, from the method of reproduction adopted, particularly the cloud traces of fig. 8. The indexes are adequate.

The Battery Book. By H. H. U. CROSS. Pp. 196; figs. 92. London: Technical Press, Ltd. Price 21s.

This book has been written from a popular angle for those concerned in any way with motor car, radio and other types of primary and secondary cells, but at the same time scattered throughout the pages will be found a measure of scientific information. The author is to be congratulated upon having compiled a book containing so much matter dealt with in a masterly manner. However, when it attains its second edition Mr. Cross might, on reflection, revise some of the matter with advantage. For instance, he states that until quite recently, one substance alone (lead) was found to be worth while considering for commercial purposes, and that all other substances formed only cells more fitted for the museum than the market. It is thirty-eight years since Jungner took out his master patent for alkaline cells, or only eighteen years after Faure took out his patent for lead batteries. We read, also, that the Chloride cell utilises lead chloride as a raw active material.

The author has tended to become a self-appointed advisory expert to the battery manufacturers, instructing them how to deal with the chemical treatment of wood for separators, the correct paste mixture and method of pasting the plate grids and condemning the use of expanders. Thirteen pages are devoted to the dry battery, of much interest but little practical value. Then follow over fifty pages dealing with the lead storage battery. This portion is outstanding and constitutes the most useful part of the book. Such a subject, however, unless dealt with by a specialised battery expert, offers many pitfalls for those who venture to handle it, and Mr. Cross is no exception. He will astound battery experts by his reiterated assertion that buckling of plates is due to high rates of discharge. He employs a very meritorious method of describing chemical reactions, and has included a useful glossary.

The book contains a voluminous description of charging apparatus for storage batteries and another section deals with battery repairs. The sketches are rather crude and in some cases superfluous. In a manual of this description it would seem desirable to deal with most of the leading makes of accumulators likely to be dealt with at a service station rather than to concentrate on one or two makes. There is an abundance of good matter in the book and it can be strongly recommended as a good reference book for instruction and advice on many of the practical aspects of storage battery care and upkeep. Mr. J. T. Fletcher contributes a delightful foreword.

Glass Working for Luminous Tubes. By H. ECCLES. Pp. 143; figs. 34. London: The Blandford Press, Ltd. Price 5s.

This well-written and amply illustrated book should be in the hands of all glass benders, both trainees and "old hands," many of whom might pay special attention to the chapter containing information about the use of the strain viewer and annealing. The strain breakage is a bugbear to nearly all neon firms and is a costly item on the running of the glass shop. A copy in the drawing office and even the sales department would not be amiss. Any intelligent young person who has not handled glass previously should be able to learn sufficient from this book to get a start in a neon shop, providing of course, he had the gas and air available for practice.

We do not agree as to some of the colours said to be obtained by the use of coloured glasses mentioned on page 18 or with the statement that all fluorescent tubes are mercury tubes. Actually there are two firms manufacturing fluorescent tubes activated by neon gas, the resulting colour being a brilliant yellowish orange in one case and in the other a mauvish pink. These latter remarks apply to matters which do not come under the title of the book and are the only real criticism.

Shorter Notices

The fifth edition of "Electric Wiring—Theory and Practice," by W. S. Ibbetson (E. & F. N. Spon, Ltd., London, price 6s.), is now available. It embodies the latest additions to the I.E.E. Regulations, the most important of which have been quoted in full. The sections devoted to alternating-current principles have again been extended, and in other parts of the book the matter has been brought up to date. Students and apprentices studying for the "B" course in electrical installation work of the City and Guilds of London Institute will find that the volume covers all the important sections of the revised syllabus, while those taking the "C" course will find much to help them.

"Dictionary of Costing," by R. J. H. Ryall, F.C.R.A. (Pp. 467; illus.) London: Sir Isaac Pitman & Sons, Ltd. Price 12s. 6d. net. This is the second edition of a work which, while described as a dictionary, is, in fact, a treatise on the principles and practice of cost accountancy. Many systems are dealt with and in each case typical forms are reproduced. The comprehensive nature of the work should make it a very useful work of reference (or, shall we say, textbook) in the offices of manufacturing concerns particularly.

"Steam Turbine Operation," by W. J. Kearton. (Third edition.) Pp. 362; figs. 215. Price 12s. 6d. "The Change-over of D.C. Supply System to the Standard System of A.C. Distribution," by S. J. Patmore. Pp. 67; figs. 18. Price 3s. 6d. London: Sir Isaac Pitman & Sons, Ltd.

"Transformer Principles and Practice," by J. B. Gibbs. Pp. 210; figs. 191. Price 15s. "Central Stations," by Terrell Croft. (Revised by G. H. Hall.) (Third edition.) Pp. 360; figs. 285. Price 18s. London: McGraw Hill Publishing Co., Ltd.

"Television," by J. H. Reyner. (Second edition.) Pp. 224; figs. 126. London: Chapman & Hall, Ltd. Price 12s. 6d.

"Epicyclic Gearing," by R. McGrae. Pp. 46; figs. 18. London: The Draughtsman Publishing Co., Ltd. Price 2s.

"Alternating Current Electrical Engineering," by Philip Kemp. (Fifth edition.) Pp. 611; figs. 421. London: Macmillan & Co., Ltd. Price 15s.

Parliamentary News (BY OUR SPECIAL REPORTER)

Grid and Weather

In the House of Commons on December 22nd Mr. Temple Morris asked the Minister of Transport whether the recent severe weather in the West of England had exercised any effect on the grid system and the distribution of electricity.

Mr. Burgin said that during the recent severe weather there was a breakdown in the secondary grid line to Salisbury, but a supply was for the most part maintained from alternative sources. Certain transmission lines of the companies operating in that area, as well as individual service lines, were also affected, but he understood that a supply was soon generally restored.

Aircraft Anti-static Devices

Mr. Perkins asked the Under-Secretary of State for Air whether any experiments had been made in anti-static electrical devices for use in aircraft; and whether any British civil aircraft were fitted with these devices.

Lt.-Col. Muirhead said that protection of aircraft from lightning had been the subject of experiments in the past and was still receiving attention. It would be appreciated that experiments could not be carried out at will but devices were installed in aircraft and their behaviour was observed during suitable conditions. As a result of the work done certain safety precautions were prescribed in the Airworthiness Handbook for Civil Aircraft. As regarded rain, snow and dust static the only effective device, so far as was known, was the screened loop, a device normally employed with direction-finding systems in this country. As regarded radiated static, as distinct from electrification of the aircraft structure by friction effect or by passage through charged clouds, so far as was known no effective method had anywhere been devised to overcome this.

The Oxford Company

On December 23rd Brigadier-General Makins asked the Minister of Transport whether his attention had been drawn to the expressed intention of the Oxford Electric Lighting Co. in connection with the proposed sale of its undertaking to the Wessex Company, to liquidate the company and pay off the preference shareholders at par; and whether, in drafting the proposed Electricity Bill, he would, in the interests of preference shareholders in electricity undertakings which it was proposed should be absorbed under the forthcoming Bill, take powers to promote amalgamation rather than liquidation.

Captain A. Hudson said he was aware that proposals had been made for the winding-up of the company, and Gen. Makins's suggestion had been noted for consideration, but he would not expect the Minister to make any statement in advance of publication of the proposed Bill.

Lift Accidents

Sir A. Wilson asked the Home Secretary whether his attention had been drawn to the continued high number of accidents to adolescents and others in charge of or in connection with the repair of lifts: and what progress had been made by his department in investigating the best manner of dealing with this matter.

Sir S. Hoare said that so far as factory premises were concerned the law on this subject was considerably strengthened by the Factories Act of this year. He presumed, however, that Sir Arnold Wilson was referring to accidents on non-factory premises. There were no statistics available to show whether such accidents were increasing or decreasing, and, while no doubt a number of these accidents occurred to adolescents, his information did not bear out the suggestion which had been made that these formed the majority. It would be appreciated that the compulsory safeguarding or expert supervision of such lifts would require legislation. He was not in a position at present to say more than that he had not lost sight of the prospect of legislation on this subject.

Radio Relay Experiment

Sir W. Womersley, Assistant Postmaster-General, announced on December 23rd that a public experimental radio relay service was to be introduced at Southampton during 1938. In addition to the installation of a special wire network it was proposed to make a limited experiment in the distribution of broadcast programmes over the telephone system. A choice of several programmes would be provided to subscribers at a charge of 1s. 6d. a week plus a small initial payment. Subscribers would have to pay for their own loud speakers. It was hoped to commence work on the system within the next few months so as to have it working in part of Southampton in the late summer or autumn. The total capital cost of the whole Southampton system would be about £200,000.

New Parliamentary Bills

We publish below a list of proposals of an electrical nature which will come forward in the ensuing session of Parliament. Readers who are desirous of obtaining further information will find the notices in the *London Gazette* for December 7th and 10th.

Redcar, Blackburn, Birkenhead, Aberystwyth, Swinton and Pendlebury, Chichester, Wakefield, Guildford, Crewe, and Stockton-on-Tees Corporations and Clacton U.D.C.—Further powers in relation to their respective electricity undertakings.

Electric Supply Corporation, Ltd.—To transfer to the company the undertakings of certain electricity undertakers and the electricity undertaking of the Uckfield Gas & Electricity Co.; to change the name of the Uckfield Co.; to confer further powers and for other purposes.

Shropshire, Worcestershire & Staffordshire Electric Power Co.—A Bill to consolidate the Shropshire, Worcestershire & Staffordshire Electric Powers Acts and Orders, 1903 to 1933.

Gateshead Corporation.—Powers with respect to the purchase and running of certain tramways and trolley vehicles in the district.

Brighton Corporation.—To confirm an agreement between the Corporation and the Brighton, Hove & District Omnibus Co., Ltd., for the provision and working in co-ordination of passenger road transport; to confer powers upon the Corporation and the company in connection with the running of trolley vehicles; to enact provisions with respect to the abandonment by the Corporation of its tramways and with respect to Volk's Electric Railway.

Gateshead & District Tramways Co.—A Bill to authorise the company to run trolley vehicles and to abandon its tramways; and for other purposes.

London Passenger Transport Board.—To empower the Board to provide certain services of trolley vehicles; to construct new works and for other purposes.

Adjournment

Parliament adjourned for the Christmas recess on December 23rd and will reassemble on February 1st.

Chilean Electrical Imports

THE electrical import trade of Chile made a further advance in 1936. The share of the United States was only slightly less than half, or an increase of about 40 per cent. on the previous year, Germany coming next with an increased share of 36 per cent., and the United Kingdom third with about 40 per cent. more than in 1935. As a whole there was an advance of 36 per cent. in the electrical import trade of the Republic.

The following figures showing the imports by countries in the principal groups are extracted from the recently issued official returns, values being in thousands of pesos (peso=6d. for statistical purposes):—

	1936. Pesos (000).	Inc. or dec. on 1935. Pesos (000).
Lamps—		
Total	1,308	+ 38
From Germany	683	+ 42
„ United States	510	+ 70
„ Holland	51	+ 12
„ United Kingdom	25	− 14
„ Japan	24	− 29
Radio valves and earphones—		
Total	309	+ 49
From United States	250	+ 68
„ United Kingdom	19	+ 16
„ Holland	15	− 7
Telephone apparatus—		
Total	937	+ 177
From United States	133	− 37
„ United Kingdom	683	+ 273
Telegraph apparatus—		
Total	112	+ 9
From United Kingdom	37	− 43
„ Germany	26	+ 19
Radio apparatus—		
Total	2,250	− 350
From United States	1,860	− 300
„ United Kingdom	150	+ 90
Insulators—		
Total	124	− 1
From Germany	27	+ 9
„ United States	90	− 10
„ United Kingdom	5	− 2

	1936. Pesos (000).	Inc. or dec. on 1935. Pesos (000).
Cables and insulated wire—		
Total	2,862	+ 902
From Germany	847	+ 137
„ Belgium	50	+ 8
„ United States	1,700	+ 820
„ United Kingdom	200	− 90
Turbines—		
Total	216	+ 52
Motors—		
Total	1,167	+ 297
From Germany	639	+ 271
„ United States	283	− 75
„ United Kingdom	46	+ 39
„ Sweden	96	+ 14
Dynamos, alternators, convertors and unspecified electrical machinery—		
Total	630	+ 477
From Germany	405	+ 337
„ United Kingdom	111	+ 87
„ United States	76	+ 41
Transformers—		
Total	611	+ 341
From Germany	160	+ 86
„ United States	270	+ 154
„ United Kingdom	88	+ 41

	1935. Pesos (000).	Inc. or dec. on 1936. Pesos (000).
Resistances—		
Total	117	+ 47
From United States	63	+ 15
„ Germany	24	+ 19
Current meters—		
Total	430	+ 110
From United States	212	+ 5
„ Switzerland	32	+ 24
„ Germany	164	+ 75
Batteries—		
Total	228	+ 38
From Germany	32	+ 20
„ Denmark	15	− 10
„ United States	167	+ 42
„ United Kingdom	13	+ 1
Accumulators—		
Total	900	− 80
From United States	700	+ 14
„ Sweden	62	+ 16
„ United Kingdom	48	+ 8
Unspecified electrical apparatus—		
Total	474	+ 40
From Germany	118	+ 38
„ United States	266	− 4
„ United Kingdom	64	− 1

The British Industries Fair, 1938

THE list of exhibitors of electrical and allied products at the forthcoming British Industries Fair is longer than ever and contains many new names. Most of the Castle Bromwich (Birmingham) exhibitors mentioned below will appear in the Electrical Section (Cb), but others will be found in the Hardware (A), Building (B), Gas (Ca), and Engineering (D) Groups. Apart from the few Earls Court stands indicated, all the London exhibitors will be at Olympia. The Fair opens on February 21st and closes on March 4th.

Birmingham

Accles & Pollock, Ltd. ... ... D 510 & 611
Aeraspray Mfg. Co., Ltd. ... ... D 720
Aiton & Co., Ltd. ... ... D 735
Aladdin Industries, Ltd. ... ... B 417
Allday, Wm., & Co., Ltd. Ca607
Allen, Edgar, & Co., Ltd. ... ... D 719
Allied Electrical Finance Corporation, Ltd. Cb200a
Altendorf & Wright Cb708
Arrow Electric Switches, Ltd. ... Cb311
Associated Electric Vehicle Mfrs., Ltd. Cb502 & 603
Avery, W. & T., Ltd. ... ... D 412 & 515
Avery-Hardoll, Ltd. ... ... D 412 & 515
Babcock & Wilcox, Ltd. ... ... D 300 & 401
Bakelite, Ltd. Cb408
Baldwins, Ltd. Cb312
Bank Hardware Mfg. Co., Ltd. ... A 228 & 333
Barrett & Elers, Ltd. Cb720
Barronia Metals, Ltd. ... ... D 325
Becker, F. E., & Co. ... ... B 411
Beetle Products Co., Ltd. ... ... Cb504 & 605
Belling & Co., Ltd. Cb308
Belling & Lee, Ltd. Cb702
B.E.N. Patents, Ltd. ... ... B 629
Benham & Sons, Ltd. ... ... B 624
Berry's Electric, Ltd. Cb209
Best Products, Ltd. Cb704
Birkenhead Corporation Electricity Dept. Cb613
Birmingham Battery & Metal Co., Ltd. D 506 & 607
Birmingham Electric Furnaces, Ltd.... Cb214 & 313
Birmingham Electric Supply Dept. ... Cb406
Black & Decker, Ltd. ... ... Cb410 & 513
Blackwell, W., Oil Co. Cb201
Bowker, S. O., Ltd. Cb317
Bowmaker, Ltd. Cb200a
Bratt Colbran, Ltd. Ca604
Bray, Geo. & Co., Ltd.... ... ... Cb305
Britannia Batteries, Ltd. Cb503
Britannia Electric Lamp Works, Ltd. A 513
Britannia Tube Co., Ltd. ... ... D 510 & 611
British Electric Domestic Appliances, Ltd. Cb713
British Electrical Development Association, Inc. ... ... Cb306 & 407
British Emulsifiers, Ltd. ... ... A 524
British Industrial Plastics, Ltd. ... Cb504 & 605
British Oxygen Co., Ltd. ... ... D212, 312 & 411
British Sangamo Co., Ltd. Cb402
British Thermostat Co., Ltd. Cb700
British Thomson-Houston Co., Ltd. ... Cb404 & 507
British Trane Co., Ltd. ... ... B 323
British Vacuum Cleaner & Engineering Co., Ltd. Cb205
Brockhouse Heater Co. ... ... Ca606 & 709
Brooke Tool Mfg. Co., Ltd. ... ... D 625
Brooks, J. B., & Co., Ltd. ... ... B 408 & 509
Broughton, J. Cb600
Bulpitt & Sons, Ltd. ... ... A417 & Cb51
Burco, Ltd. Cb315
Bylock Electric, Ltd. Cb724
Cable Makers' Association ... ... Cb300 & 401
Candy & Co. ... ... B 406 & 507
Canning, W., & Co., Ltd. ... ... Cb120 & 215
Cardiff Corporation ... ... A 508 & 609
Carron Company Cb723
Carter & Co. (Nelson), Ltd. Cb714
Cellactite & British Uralite, Ltd. ... B 522 & 625
Cellon, Ltd. ... ... B 529
Chance Bros. & Co., Ltd. ... ... D 329
Chase Non-Ferrous Metal Co., Ltd. ... Cb724
Cherry Tree Machine Co., Ltd. ... A 406
Clayton, Son & Co., Ltd. Ca403
Chloride Electrical Storage Co., Ltd.... Cb307
Coleman & Appleby, Ltd. Cb216
Combi Electric Co., Ltd. Cb610
Commutator Grinding Block Co. ... Cb728
Concordia Electric Safety Lamp Co., Ltd. Cb505
Constructors, Ltd. ... ... Cb506 & 607
Cotto Products ... ... A 326
Crockatt, W., & Sons ... ... D 718a
Crumblehulme, Ltd. ... ... B 500 & 601
Daniels, T. H. & J., Ltd. Cb125
Desoutter Bros., Ltd. ... ... Cb118 & 213
Diamond H Switches, Ltd. Cb512
Dick, R. & J., Ltd. ... ... D 213
Dominion Machinery Co., Ltd. ... B 325
Donovan Electrical Co., Ltd. Cb309
Drew, Clark & Co. ... ... A 232
Dyson (1929), Ltd. Cb724
Earle, Bourne & Co., Ltd. ... ... D 500
Eaves, Thomas, Ltd. Cb302
ELECTRICAL REVIEW Cb218
Electricars, Ltd. ... ... Cb502 & 603
Electrona Electrical Products, Ltd. ... B 211
Elkington & Co., Ltd. ... ... D 507
Elliott, E., Ltd. Cb413
Enfield Rolling Mills, Ltd. ... ... D 224 & 321
English Electric Co., Ltd. ... ... Cb510 & 611
Ether, Ltd. Cb716
Evenlite Tube Lamp Development, Ltd. Cb114
Fastnut, Ltd. ... ... B 209
French, W. T., & Son ... ... A 433
Gascoignes (Reading), Ltd. ... ... D 707
General Electric Co., Ltd. Cb517
Gent & Co., Ltd. Cb515
George, W. & J., Ltd. ... ... B 411
Gilman, F. (B.S.T.) Ltd. Cb516
Girdlestone & Co. ... ... D 323
Gittings & Hills, Ltd. ... ... B 324
Gordon, James, & Co. Cb716
Greenwood & Batley, Ltd. ... ... D 214 & 313
Guest, Keen & Nettlefold, Ltd. ... B 524
Guests Brass Stamping Co. ... ... D 533
G.W.B. Electric Furnaces, Ltd. ... Cb204 & 303
Hague & McKenzie, Ltd. Cb400
Halden, J., & Co., Ltd. Cb206
Harper, J., & Co., Ltd. Cb601
Harvey, G. A., & Co. (London) Ltd. ... B 329
Hawkes, O. C., Ltd. ... ... B 412
Hawkins, L. G., & Co., Ltd. Cb609
Heayberd, F. C., & Co. Cb620
Hendon Chemical Co. Cb208
Herbert, Alfred, Ltd. ... ... D 304 & 309
Higgs Motors, Ltd. Cb617
Holden & Hunt ... ... Cb602 & 703
Horstmann Gear Co., Ltd. Ca408
Hotpoint Electric Appliances Co., Ltd. Cb509
Hufton, Chas., & Sons, Ltd. ... ... A 414
Hyders Cb722
I.C.I., Ltd. (Degreasing) ... ... D 305
I.C.I., Ltd. (Heat Treatment) ... ... D 206
I.C.I. Metals, Ltd. ... ... D 302 & 403
International Combustion, Ltd. ... ... D 114 & 215
International Refrigerator Co., Ltd.... Cb614
Ioco Rubber & Waterproofing Co., Ltd. Cb624
Jackson Electric Stove Co., Ltd. ... Cb409
Jiffy Automatic Clothes Washer Co.... A 527
Johnson, Matthey & Co., Ltd. ... Cb211
Kaufmann, H. ... ... A 506 & 607
Kitchendom, Ltd. ... ... A 600
Knightshades, Ltd. Cb207
Lacrinoid Products, Ltd. ... ... A 526a
Ley's Malleable Castings Co., Ltd. ... D 402 & 503
Lister, R. A., Ltd. ... ... D 204
London Aluminium Co., Ltd. ... ... A 310 & 411
London Elec. Wire Co. & Smiths, Ltd. Cb612
London Wire Co., Ltd.... ... ... A 426
Lucas, Joseph, Ltd. Cb501
Lusty, W., & Sons, Ltd. ... ... A 622
Macpherson, Donald, & Co., Ltd. ... B 527
Mansions Motor Co., Ltd. ... ... D 708
Martindale Electric Co., Ltd. Cb606
M.C.L. & Repetition, Ltd. ... ... D 406
Metalectric Furnaces, Ltd. ... ... D 502 & 603
Metlex Industries, Ltc. ... ... A 322
Metropolitan-Vickers Electrical Co., Ltd. Cb220
Midland Fan Co., Ltd. ... ... A 614
Midland Metal Spinning Co., Ltd. ... A410 & Cb202
Mirrlees, Bickerton & Day, Ltd. ... B 322
Mirrlees, Watson Co., Ltd. ... ... B 322
Modern Products (L.C.L.), Ltd. ... Cb711
Moffats, Ltd. Cb511
Morecambe Electrical Equipment Co., Ltd. Cb710
Morrison, A. E., & Sons, Ltd.... ... Cb502 & 603
Moseley, David, & Sons, Ltd.... ... D 630
Moss Gear Co., Ltd. ... ... D 420
National Time Recorder Co., Ltd. ... Ca205
Neill, James, & Co. (Sheffield), Ltd.... D 527 & 529
Newall's Insulation Co. ... ... D 521
Omes, Ltd. ... ... D 724
Orme, Evans & Co., Ltd. Cb500
Osborn Mfg. Co., Ltd. Cb616
Ozalid Co., Ltd.... ... ... Cb707
Packless Gland Co. Ltd. Cb700
P. B. Sillimanite Co., Ltd. Cb622
Peglers, Ltd. ... ... B 421
Perkins Clean Milk Equipment, Ltd.... A 625
P. & H., Ltd. Cb501
Philips Industrial Cb712
Pinchin, Johnson & Co., Ltd. ... B 516 & 619
Power Centre Co., Ltd. Cb618
Pyrotenax Ltd. Cb112
Radiovisor Parent, Ltd. Cb319
Rapid Magnetting Machine Co., Ltd.... Cb412
Rawlplug, Ltd. Cb210
Redmanol, Ltd. Cb408
Revo Electric Co., Ltd. ... ... Cb 304 & 405
Revvo Castor Co., Ltd. ... ... D 331
Rheostatic Co., Ltd. ... ... Cb310 & 411
Robbins & Bradley Cb500a
Rotax, Ltd. Cb501
Rowlands Electrical Accessories, Ltd. Cb106
Rubery, Owen & Co., Ltd. Cb705
Rudd, E., & Co., Ltd. Cb200
Runbaken Electrical Products ... Cb100
Ruston & Hornsby, Ltd. ... ... D 407
Sankey, Jos., & Sons, Ltd. ... ... A412 & B513
Scottish Development Council ... A 530
Sichel, O., & Co. Cb711
Simmonds Aerocessories, Ltd. ... D 421
Simmons Holloware Co., Ltd. ... A 300
Simplex Electric Co., Ltd. ... ... Cb314 & 415
Small, W. R., Ltd. Cb706
Smellie, James, Ltd. ... ... B 519
Smith, Frederick, & Co. Cb612
Smith Meters, Ltd. ... ... Cb102 & 203
Standard & Pochin Bros., Ltd. ... B 420
Steam Gauge Mfg. Co., Ltd. ... ... D 712
Stewarts & Lloyds, Ltd. ... ... D 400 & 501
Stirling Boiler Co., Ltd. ... ... D 300 & 401
Streetly Mfg. Co., Ltd. ... ... Cb504 & 605
Strong & Co. Cb615
Summerscales, W. & S., & Sons ... A 519
Sutherland Meter Co., Ltd. Ca208
Tarpen Engineering Co., Ltd. ... Cb726
Taylor, Chas. (Birmingham), Ltd. ... D 717
Taylor & Challen, Ltd.... ... ... D 409
Taylor, Taylor & Hobson, Ltd. ... D 714
Tecalemit, Ltd. ... ... D 316 & 415
Teddington Controls, Ltd. Cb700
Telegraph Construction & Maintenance Co., Ltd. Cb403
Terry, Herbert, & Sons, Ltd. ... ... B 424
Thomas, Bertram Cb321
Thompson, J. (Wolverhampton), Ltd. D 606 & 709
Timmis & Co., Ltd. Cb601a
Titanine, Ltd. Cb208
Tube Products, Ltd. ... ... D 517
Tubes, Ltd. ... ... D508 & 609
Turners' Asbestos Cement Co.... ... Ca301
United Steel Coys., Ltd. ... ... D 512 & 613
Vacuum Oil Co., Ltd. ... ... D 419
Van Dorn Electric Tools ... ... Cb410 & 513
Vulcanised Fibre, Ltd. ... ... D 207
Waddicor (Bradite), Ltd. Cb719
Wakefield, C. C., & Co., Ltd. Cb301
Walker, Jas., & Co., Ltd. ... ... D 620
Walmsley Patent Lamp Co., Ltd. ... Cb721
Ward, H. W., & Co., Ltd. ... ... D 315
Westinghouse Brake & Signal Co., Ltd. Cb508
Whittaker Bros. (Accrington), Ltd. ... A 314
Wilcox & Pitman ... ... A 408
Wild-Barfield Elec. Furnaces, Ltd. ... Cb204 & 303
Wilkins & Mitchell Cb604
Williams (Birmingham), Ltd.... ... A 312 & 413
Williams, John, & Sons (Cardiff), Ltd. D 526
Winston, Thos., Ltd. ... ... A 404
Wolseley Sheep Shearing Machine Co., Ltd. ... ... D 705
Worksop Corpn. Elec. Dept. ... ... Cb715 & 717
Yorkshire Copper Works, Ltd. ... B 630 & 717
Young Accumulator Co., (1929) Ltd.... Cb608

London

A.B.E.C., Ltd. ... ... D 1151
Air-Glow Lights, Ltd. ... ... C 1039
Aladdin Industries, Ltd. ... ... F 1362
Allen & Hanburys, Ltd. ... ... A 642 & 644
Alter, Henry J. ... ... D 1106
Amplivox, Ltd. ... ... A 663
Anstey & Wilson, Ltd. ... ... E 1209
Ashdown, H. E. (Birmingham), Ltd.... A 677
Baird Television, Ltd. ... ... A 709
Bakelite, Ltd. ... ... A 684
Baker, Charles ... ... A 635 & 651
Barr & Stroud, Ltd. ... ... A 614
Beck, R. & J. ... ... A 636 & 650
Belgrave Electric Co., Ltd. ... ... F 1306
Bentima Co., Ltd. ... ... D 1145
Binger, O. D. (Sales Aids), Ltd. ... D 1122A
British Alabaster & Arts Co., Ltd. ... F 1395
British Electric Domestic Appliances, Ltd. ... ... G 1526
British Plastics Federation, Ltd. ... A 711
British Vacuum Cleaner & Engineering Co., Ltd. ... ... D1139 & G1523
Brook, J. A., Ltd. ... ... E 1207
Burton Holt (Chelsea), Ltd. ... ... F 1330
Butler, George (Dudley), Ltd. ... Earl's Court 439
Bylock Electric, Ltd. ... ... G 1528
Candy & Co., Ltd. ... ... C 1000
Catalin, Ltd. ... ... A 683
Chance Bros. & Co., Ltd. ... ... A 622
Cole, E. K., Ltd. ... ... A 702
Cook, T. P., & Co. (Sales), Ltd. ... F 1416
Daniels, T. H. & J., Ltd. ... ... A 682
De la Rue, Thomas, & Co., Ltd. ... A 696 & 704
Dent, R. H., Ltd. ... ... A 655 & 661
Dernier & Hamlyn, Ltd. ... ... F 1401
Dictograph Telephones, Ltd. ... ... F 1324
Dominion Electrical Co. ... ... C 1036
Doughty, J. M., & Sons, Ltd.... ... Earl's Court 169
Ebonestos Insulators, Ltd. ... ... A 697
Edgware Shade Co. ... ... F 1308
Electric Art Shades (1928), Ltd. ... F 1437
Elliott, F. W., Ltd. ... ... D 1144
Elliott & Spear, Ltd. ... ... F 1365
Enfield Clock Co. (London), Ltd. ... D 1137
Foster, A. E. ... ... F 1334
Garrard Clocks, Ltd. ... ... D 1143
G.M.C. Mouldings, Ltd. ... ... A 700
Grimshaw, Baxter & J. J. Elliott, Ltd. D 1148
Hanovia, Ltd. ... ... A 656 & 660
Hilger, Adam, Ltd. ... ... A 613
Hoover, Ltd. ... ... G 1525
Hughes, F. A., & Co., Ltd. ... ... A 703
Ideal Home Electrical Appliances, Ltd. A 657
Imperial Chemical Industries, Ltd. ... A 612 & 626
Injection Moulders, Ltd. ... ... A 679
Insulators, Ltd. ... ... A 698
Jaffe & Rose ... ... F 1328
Johnson, Matthey & Co., Ltd. ... E 1240
Kent Mouldings... ... ... A 701
K.F.M. Engineering Co., Ltd. ... D 1135
Leek, E. & J., Ltd. ... ... E 1236
London Electric Clock Co. ... ... D 1138
Mallinson & Eckersley, Ltd. ... ... F 1303
Mayfair Shades, Ltd. ... ... F 1430
Mouldrite, Ltd. ... ... A 676 & 685
National Clock Mfg. Co., Ltd.... ... D 1140
New Welbeck, Ltd. ... ... G 1527
Norma Technical Products, Ltd. ... E 1206
Radio Gramophone Development Co., Ltd. ... ... A 750 & 766
Short & Mason, Ltd. ... ... A 653
Smith's English Clocks, Ltd. ... ... D 1151
Speights, Ltd. ... ... F 1428
Stadium, Ltd. ... ... H 1629
Steiner, I. & M., Ltd. ... ... G 1502A
Sullivan, H. W., Ltd. ... ... A 646
Thermega, Ltd. ... ... A 659
Tintometer, Ltd. ... ... A 654
Union Radio Co., Ltd. ... ... A 741
Waite & Son, Ltd. ... ... F 1345
Walker Fender Co., Ltd. ... ... Earl's Court 157
Webb's Crystal Glass Co., Ltd. ... A 816
Woolf, Lewis, Ltd. ... ... A 714

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

Engineering Apprentices' Pay

A meeting of the Engineering Joint Trades Movement at York on December 23rd accepted joint recommendations of the employers and representatives of the engineering unions dealing with apprentices, boys and youths. According to the *Financial News* these provide that boys may raise questions affecting themselves directly with their foreman or through district officials of unions to which they belong, and that when adult wage movements take place boys', apprentices' and youths' wages shall be adjusted on a percentage basis. Local application may also be made for adjustment of juvenile wage schedules.

London Wholesalers' Showrooms

Brown Bros., Ltd., have recently opened newly acquired premises adjoining the company's main buildings. The new premises have a frontage in Gt. Eastern Street, E.C.2, of

A section of the new showrooms of Brown Brothers, Ltd.

approximately 60 ft. They have been designed to display electrical equipment in more or less natural settings and each fitting is operated by its own independent wall or ceiling switch, there being over 250 points of supply available. There are offices on the first floor of the new premises and the basement and the two upper floors are used for storage.

New E.C.A. Members

At a recent meeting of the Council of the Electrical Contractors' Association a number of applications for membership were considered, and the following contractors were admitted to full membership :—

E. Norman, Walton-on-the-Naze; C. C. Boggis, Wrentham, Beccles; W. H. Green (W. H. Green (Engineers), Ltd.), Lowestoft; W. H. Brown (Brown & Payne), Norwich; C. E. Mountain (Northbourne Electrical Co.), Northbourne, Bournemouth; J. E. Skyrme (Thurman), Dorchester; J. W. Collins (J. W. Collins & Sons), Hassocks, Sussex; B. A. Hall (Hastings Electrical Co.), Hastings; E. C. Cosh (Cosh & Hammond), Littlehampton; P. N. Murdock (E. H. Murdock & Co.), Dun Laoghaire, Co. Dublin; W. Wadham (J. B. Saunders (1923), Ltd.), Cardiff; V. J. Pope (J. Pope & Co.), Plymouth; J. W. Prescott, Peterborough; W. R. Reeve, Bourne, Lincs; Alfred Spurr (H. H. Spurr), Retford; J. L. Harvey (Walter Jones, Harvey & Co., Ltd.), Swadlincote; R. Butland, Ruthin; J. H. Williams, Glan Conway; J. Knox, Keighley, Yorks; A. W. Airey (Keswick Electrical Service), Keswick.

The following contractor was admitted to associate membership : L. Barr (L. Barr & Co.), Clacton.

Municipal Trading at Southend

The report of the borough electrical engineer (Mr. A. C. Johnson) to which we made reference in our last issue came before the Southend Town Council last week. It was presented by Ald. S. F. Johnson as a part of the report of the subcommittee of the Electricity Committee dealing with the subject of the sale and hire and hire-purchase of electrical appliances. The sub-committee recommended the adoption of the engineer's proposals, stating that an alternative scheme put forward by the local Chamber of Trade would prove unsatisfactory in operation and involve the electricity undertaking in a financial loss. According to the *Southend Standard* Ald. Johnson said that far from injuring local electrical contractors and traders the Department, by its progressive policy, had placed orders with them aggregating £60,000 in six years. During this month the Department was placing wiring work to the value of £900 with contractors, who would also provide the fittings required. In the supply of small appliances the traders should fear the big stores more than the Electricity Department, which only wanted to be in a position to supply appliances for which consumers asked. The speaker pointed out that during 1937 fourteen contractors had obtained 1.8 per cent. of the cooker agreements, while the Department's staff of twenty-two had been responsible for the other 98.2 per cent. The Ironmongers' Federated Association had protested against the sub-committee's proposals. He described the letter as "inaccurate and very misleading" and said that it came from Birmingham, one of the 76 undertakings which sold appliances direct to the consumer. He also referred to the taking over of the sale in Southend of vacuum cleaners produced by a certain firm which otherwise would have taken its business to a multiple store.

In the discussion Ald. Johnson said that although only a small balance was expected during the current year the undertaking was a prosperous one with a reserve of £70,000 and a working balance of £60,000. All that was needed was extra consumers. He claimed that the rates were too high; the Southend undertaking was unfairly assessed in comparison with other undertakings of similar size. Councillor Lewis moved the reference back of the section of the report dealing with the hire-purchase and sale of appliances, saying that the sale of small appliances would not repay the increased cost of collecting and clerical staffs. Ald. Bockett criticised the finances of the Department, alleging that expenditure was increasing at a greater rate than the revenue. He maintained that the adoption of the proposals would cripple local traders. Ald. Johnson replied to the criticisms but the motion to refer the report back was carried.

Japanese Competition in the United States

Serious competition, in the American market, from miniature incandescent lamps imported from abroad is revealed in statistics issued by the United States Tariff Commission. According to the *Electrical World*, these imports during 1936 numbered 117,254,890 units, valued at $653,273, virtually all from Japan. For comparison, the latest available governmental statistics of production in the United States—the Census of Manufactures for 1935—give the number of Christmas-tree lamps manufactured as 109,343,810, or less than last year's imports from Japan. In most other respects imports of electrical goods are small compared with American production. Only 5,132 vacuum cleaners were imported; the quantities of other electrical household and office appliances were negligible. X-ray equipment was valued at about $160,000. Turbines and parts amounted to $117,970. Total imports of all classes of machinery and vehicles were valued at $18,746,000; electrical machinery and apparatus constitute a sub-class in this group.

A Water-heater Campaign at Ilford

Mr. G. F. Gregory, borough electrical engineer and manager at Ilford, informs us that as the result of an intensive water heating campaign, the Electricity Department has connected 1,318 additional electric water heaters during the past six months.

Glass Convention

The fifth Glass Convention will be held at the Norbury House Hotel, Droitwich, from May 18th to 21st, 1938, inclusive. Mr. H. S. Williams-Thomas will act as president, and Lord Austin will be one of the principal guests. The president has chosen for his address "Craftsmanship in Industry." The technical sessions arranged by the Society of Glass Technology will include "Glass Finishing Processes" and "Plastics and Their Relation to the Glass Industry."

Birmingham Electric Club

The annual general meeting of the Birmingham Electric Club was held at the Grand Hotel on December 20th. The annual report and balance sheet showed that during the 1937 session forty-five new members had been elected. There were fourteen resignations, one death, and three members lapsed. The net increase was therefore twenty-seven, bringing the total membership up to 436. It was reported that, acting on a resolution adopted two years ago, the Council had presented five prizes of £1 each to a student in each year of the Higher National Certificate Course at the Central Technical College. The Research Premium which the club also agreed to present was not awarded for the past session, as no suitable student was engaged in research work. The balance sheet showed a credit balance of £141.

Orders Recently Booked

Among orders recently received by Broom & Wade, Ltd., for air compressors, is a complete air compressing plant for the Littlebrook power station scheme. This will comprise three single-stage air compressors of the makers' standard type, each actually delivering 300 cu. ft. of free air per min. at 100 lb.

pressure, arranged for vee-rope drive from slip-ring induction motors. Each compressor will be fitted with two automatic air governors to provide for the supply of compressed air at will either at 110 lb. per sq. in. pressure for pneumatic tool operation, or at 40 lb. per sq. in. for caisson sinking.

The General Electric Co., Ltd., has received an order for the supply of seventy-four complete sets of "Osira" lighting equipments, including 400-W high-pressure mercury-vapour lamps, di-fractor lanterns, chokes, condensers, time switches, and 25-ft. spun concrete columns for factory approach and exterior lighting at Courtaulds, Ltd., Flint, North Wales. In addition to the above-mentioned equipment a number of illuminated guard posts and also lighting equipment for water-softening plant are being supplied.

James Kilpatrick & Son, Ltd., have obtained a contract for the complete electrification of the new distillery being erected at Dumbarton for Hiram Walker & Sons (Scotland), Ltd., the value of the contract amounting to over £10,000. The company has also recently booked the following contracts: Electrical equipment of factories at Hillington Estate for Scottish Industrial Estates, Ltd.; complete electrical equipment, Ryhope Mental Hospital, for Sunderland Corporation; electric lighting of Myton Grange Cottage Homes, Warwick; and electrical equipment for Biddulph Grange Orthopædic Hospital and the Royal Ordnance Factory ,Irvine.

Old Cromptonians

The December issue of the *Journal* of the Association of "Old Cromptonians," in addition to containing news and articles of interest to its members, includes an alphabetical list of members, with brief biographical notes.

Price Increase

Siemens Electric Lamps & Supplies, Ltd., announce that revised prices for dry batteries for bells and other types of large dry cells will come into force in the New Year. The new prices represent a 10 per cent. increase on old list prices. Trade discounts and settlement terms will remain unaltered. A revised battery catalogue will be issued shortly.

Calendars, Diaries, Etc.

A picture of the Bay of Naples has been chosen for the neat calendar of Accumulators of Woking, Ltd.

Scenes of Swiss beauty spots have been selected by British Brown-Boveri, Ltd., for its calendar.

A picture entitled "The Best of the Day," which shows a lady on horseback, adorns the calendar of Milne & Longbottom.

"Do You Like Butter?" is the title of a charming picture of the calendar of G. E. Wallis & Sons, Ltd., which shows a young man holding a buttercup under a maiden's chin.

The British Thermostat Co., Ltd., has again sent us a stainless steel pocket knife.

Landis & Gyr, Ltd., have sent us a refill for their desk calendar.

A neat vest pocket diary with a brown binding has been received from the Arora Co.

British National Electrics, Ltd., has sent us a brown bakelite desk ashtray.

A picture of the source of the Thames surmounts the calendar of Thames Board Mills, Ltd.

The West of England Electric Investments, Ltd., and associated companies have sent us a calendar which has monthly sheets, each with a rural scene in the companies' area of supply.

Illustrations of lighting installations employing Holophane fittings appear on the calendar of Holophane, Ltd.

The Automatic Telephone & Electric Co., Ltd., has sent us a propelling pencil in black, and a handy stainless steel pocket knife.

The calendar of the Spencer Wire Co., Ltd., has large daily tear-off slips and can be used either as a desk or wall calendar.

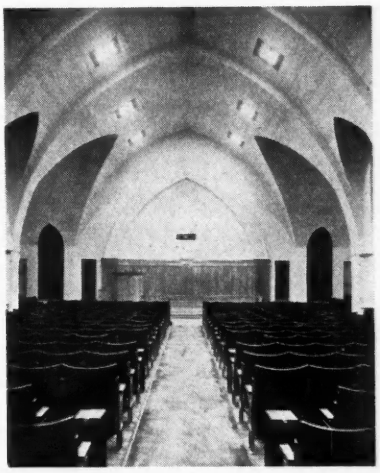
G. S. Peckham & Co. have again sent us a desk blotter bound in dark green leatherette, which incorporates a diary for 1938.

Brittain's Electric Motor Co. have an illustration of one of their motors above their calendar, which has monthly sheets.

The block calendar of the Kniveton Cable Works, Ltd., has an aerial view of the company's works, set in a Union Jack.

A Church Lighting Installation

The accompanying illustration shows a lighting installation with Holophane "built-in" units at the Church of St. Margaret, Luton. The lighting units are of a special design to incorporate ventilation grilles and the designs and scheme were prepared by the Holophane Technical Department in conjunction with Mr. J. E. Burrows, electrical contractor, of Luton. The main lighting is by means of twelve flush ceiling units of four-panel design, using four 75-W lamps. The altar is illuminated by means of a suspended trough fitting.



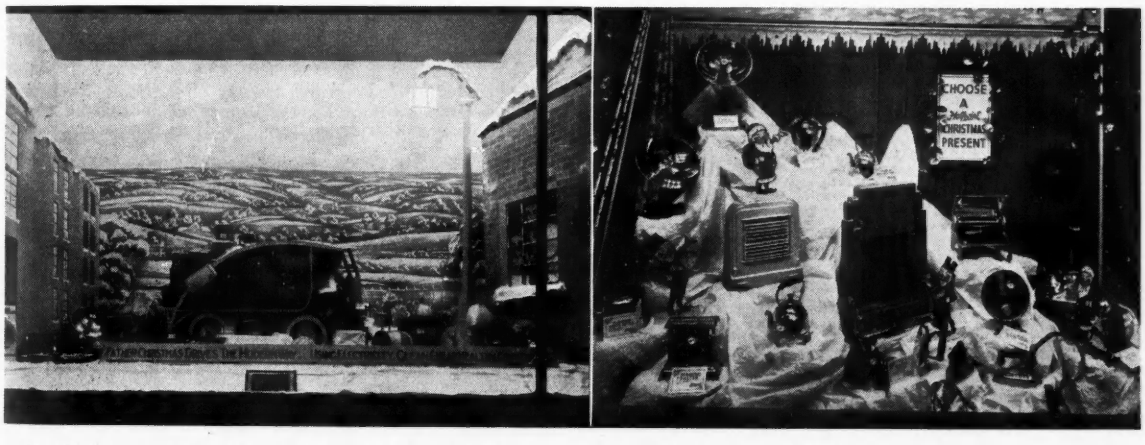
A Holophane lighting installation at the Church of St. Margaret, Luton

"Engineering Abstracts"

From January, 1938, "Engineering Abstracts" will be issued monthly in sectionalised form so that subscribers will be able to purchase individual sections. The Abstracts will also include references to important articles in British as well as foreign journals.

Christmas Window Displays

Most electricity undertakings arranged special window displays at their showrooms for the Christmas season, and we have received from Mr. J. W. J. Townley, engineer and manager of the West Ham Corporation Electricity Department, photographs of two effective displays arranged by his Department. The one which we illustrate shows the display at the Romford Road showrooms, and as will be seen Santa Claus has been provided with a modern electric vehicle in place of the traditional sleigh. The slogan "Father Christmas drives the modern way—using electricity, clean, cheap, healthy convenient," is effectively linked with the festive season by the van being loaded with electrical presents. Movement is provided in the display by the van's revolving wheels and a band of trams, trolley-buses and vehicles passing continuously across the back of the display. The electric vehicle is a replica of those used by the Department, and there are also replicas of the new street standards and mercury-discharge lamps used in the borough. At the branch showroom at Barking Road, Canning Town, the display is along more orthodox lines, play being made of the long life of electrical gifts.



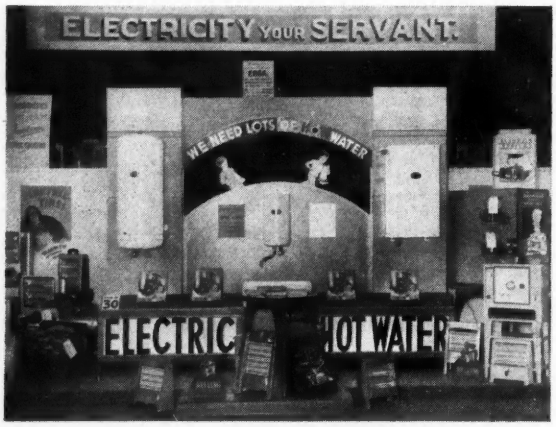
Two Christmas window displays: The Romford Road showrooms of the West Ham Electricity Department (left) and a Hotpoint display at the showrooms of the Wimbledon Electricity Department

A the Wimbledon Bridge showrooms of the Wimbledon Corporation Electricity Department there is a general display of Hotpoint appliances, the "Redmen" being dressed as Santa Claus.

An Electrical Display at Clacton

At the recent Trade Fair held in the Town Hall, Clacton-on-Sea, under the auspices of the local Chamber of Commerce,

the U.D.C. Electricity Department had a stand on which was displayed a wide range of electrical appliances. On the stage cooking demonstrations were given each day by Miss Astley, of the Jackson Electric Stove Co., Ltd., as a result of



The stand of the Clacton Electricity Department at the recent local Trade Fair

which many applications for cookers were received. All appliances signed up at the exhibition were supplied rent free for the first quarter.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances :—

CHEMICALS, ETC.	Price December 29th.	Fortnight's Inc. or dec.
a Acid Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£36	—
a Ammonia, Muriate (large crystal)... ,,	£18 10s.	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£22 10s.	—
a Potash, Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac ... ... per cwt.	£4 18s.	—
a Sulphur, Commercial ... ... per ton	£11	—
a ,, Roll .. .. ,,	£11	—
a Soda, Chlorate ... ... per lb.	3½d. to 3¾d.	—
a ,, Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. net.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil .. ... ,,	1/3 to 2/9	—
p Babbitts Metal and Anti friction Metals—		
Grade I ... ... per ton net	£187	—
Grade II ... ... ,,	£131	—
Grade III... ... ... ,,	£75	—
c Brass (rolled metal 2" to 12" basis)... per lb.	8¼d.	—
c ,, Tubes (solid drawn) ... ... ,,	11¼d. to 11½d.	—
c ,, Wire, basis ... ... ,,	8¾d.	—
c Copper Tubes (solid drawn) ... ,,	1/0½	—
g ,, Bars (best selected)... ... per ton	£74	£2 dec.
g ,, Sheet... ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£44	£1 dec.
d ,, ,, Wire Rods ... ,,	£49 10s.	£1 dec.
d ,, ,, H.C. Wire ... per lb.	8d.	¼d. dec.
f Ebonite Rod ¼" dia. & up ... ... ,,	1/10 to 2/5	—
f ,, Sheet ⅛" thick & up ... ,,	1/5 to 1/10	—
n German Silver Wire, Nos. 1 to 12... ,,	2/4	—
h Gutta-percha fine ... ... ,,	nom.	—
h India-rubber, Para-fine ... ... ,,	7¼d.	¼d. dec.
i Iron, Pig (Cleveland, No. 3) ... per ton	£4 5s.	—
i ,, Wire galv. No. 1 P.O. Qual.... ,,	£23	—
g Lead, English Pig ... ... ,,	£17 15s.	10s. inc.
g Mercury ... ... per bot.	£13	—
e Mica (in original cases) small ... per lb.	10d. to 2/–	—
e ,, ,, ,, medium ... ,,	6/– to 12/6	—
e ,, ,, ,, large ... ,,	13/– to 17/6 up	—
p Phosphor Bronze, plain castings ... ,,	1/2¼	—
p ,, ,, drawn bars & rods ,,	1/1½	—
p ,, ,, rolled strip & sheet ,,	11d.	—
p ,, ,, wire ... ... ,,	1/0¾	—
o Platinum ... ... per oz.	£7 12s. 6d.	—
d Silicium Bronze Wire ... ... per lb.	8¾d.	¼d. dec.
g Spelter ... ... per ton	£15 2s. 6d.	6s. 3d. inc.
g Tin, Block (English) .. .. per ton	£188 5s.	£2 5s. dec.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	4/3	—

Quotations supplied by :—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in our "Business Notes" under the same heading.

Trade Announcements

Tubelight Holders, Ltd., has removed to First Avenue House, High Holborn, W.C.1 (telephone: Holborn 6041 and 8971).

The Leeds office of C. A. Parsons & Co., Ltd., has been removed to Royal Insurance Buildings, 32, Church Street, Sheffield, 1. (Telegraphic address: Turbo Sheffield. Telephone: Sheffield 21571.)

Taynor Machines, Ltd., and its associated companies have transferred their sales organisations to Clifton House, Euston Road, N.W.1 (telephone: Euston 5432).

A. F. Phillipson & Co., Ltd., have removed to Tariff Road, Northumberland Park, Tottenham, N.17. The telephone number will remain the same.

The Lightfoot Refrigeration Co., Ltd., announces that it is erecting new offices and works on the North Circular Road, Wembley, to which its headquarters will be moved. The new premises will cover more than an acre, and ample provision has been made for future expansion, additional land having been acquired for the erection of new manufacturing units as and when required.

"Clesco" Publicity

During the Christmas season the County of London Electric Supply Co., Ltd., and its associated companies issued a special page advertisement which appeared in the local Press covering the area of supply. This urged consumers to make greater use of the services of electricity during the coming year, and in the interests of national fitness to use domestic electrical appliances in the home.

Social Event

An enjoyable evening was spent by the staff of the Settle and District Electricity Co., Ltd., their wives and friends, on December 6th, on the occasion of the annual dinner and dance. After an excellent dinner, consisting chiefly of Christmas fare, toasts were proposed by Messrs. G. E. W. Knowles (engineer and manager to the company), W. C. Knowles (electrical engineer and manager, Elland U.D.C.), and J. Hindman (accountant to the company). The toasts of "The Company" and "Guests" were responded to by Messrs. G. E. W. Knowles and L. Cooper (general manager and director, Settle Limes, Ltd.).

Fire at H.M.V. Premises

A fire occurred on Monday last at the H.M.V. Oxford Street premises of Electric & Musical Industries, Ltd., which resulted in considerable damage to the stock of radio and television sets, refrigerators and gramophone records.

Manchester Cinema Operators' Wages

Negotiations have been completed between Manchester Branch of the Electrical Trades Union and the Cinematograph Exhibitors' Association (Manchester Branch) for new working rules for cinema operators and assistants. It is laid down that the rate of wages for first projectionists shall vary between £3 and £5 5s., according to the grade of theatre; £2 5s. to £3 10s. for second projectionists, and £1 2s. 6d. to £2 10s. for third projectionists. Where a fully skilled electrician is employed in what are described as A.A. halls he shall be paid not less than £5 5s. per week. It is provided that each operator shall maintain in good repair and reasonable working order all electrical and mechanical and screen equipment. No operator is expected to work without a full-time assistant.

Paris Transport Strike

A *Reuter* message from Paris reports that a lightning strike affecting all services controlled by the Paris Municipality, including electricity, which was scheduled to start as from December 29th, was called on Tuesday night. A strike of buses and tubes was also decided upon in sympathy with the municipal workers. The decision was taken by a joint committee of public service workers' unions in protest against the decision of the Paris City Council to make pay cuts in the lower grades. Following the meeting of the joint committee, delegates from all the unions concerned assembled and unanimously decided to strike until the City Council acceded to their demands.

New Catalogues and Lists

Fry's Metal Foundries, Ltd., Tandem Works, Merton Abbey, London, S.W.19.—A leaflet dealing with "Fryal" aluminium solder.

British Insulated Cables, Ltd., Prescot.—A leaflet describing dwarf-type pillars.

Turner's Asbestos Cement Co., Ltd., Trafford Park, Manchester, 17.—Pamphlets illustrating "Sindanyo" arc and heat-resisting boards and insulating boards.

Wholesale Fittings Co., Ltd., 23/37, Commercial Street, London, E.1.—A 48-page illustrated catalogue of domestic appliances.

R. F. Winder, Ltd., Belgrave Electrical Works, Leeds.—A catalogue of surplus new and second-hand electrical equipment.

Bankruptcy Proceedings

A. C. Hall, 65, St. Thomas's Road, Worthing, electrician.—The public examination of this debtor was held on December 17th at the Court House, Brighton, when it was stated that there were gross liabilities of £759, of which £243 was expected to rank for dividend, with a deficiency of £139. The debtor ascribed his failure to competition and under-estimating. The examination was adjourned for closing.

N. Hodgson, electrical engineer, 3, Gurney Street, Middlesbrough.—First meeting, December 31st, at 80, High Street, Stockton-on-Tees. Public examination, January 28th, at the Court House, West Middlesbrough.

E. A. V. Burton, electrical engineer, 14, St. Peter's Park Road, Broadstairs.—First and final dividend of 6d. in the £, payable December 31st, at 1, The Parade, Canterbury.

J. L. Gaved, electrical transmission engineer, 7, St. Stephen's Street, Bristol.—Trustee, Mr. F. E. Bendall, Midland Chambers, Warwick Passage, Corporation Street, Birmingham, released December 10th.

A. L. J. Stanway, radio dealer, 2, The Arcade, Otley.—First meeting January 6th at 24, Bond Street, Leeds. Public examination January 18th at the County Court House, Leeds.

Company Liquidations

J. Wride's Radio Depot, Ltd., radio dealers, 43, Flixton Road, Urmston.—The statutory meeting of creditors was held recently at the Victoria Hotel, Deansgate, Manchester, when Mr. H. Nicholas, the managing director of the company, presided. A statement of affairs was submitted which disclosed ranking liabilities of £2,233, of which £1,109 was due to a cash creditor and the balance to trade and sundry creditors. In addition, there were fully secured creditors for £54. According to the books the assets totalled £1,703, and they were estimated to realise £717. From the latter amount had to be deducted preferential claims of £13, leaving net assets of £704, or a deficiency, so far as the creditors were concerned, of £1,529. The issued capital of the company was £100, and as regarded the shareholders there was a deficiency of £1,629. There was a footnote to the statement to the effect that there was a contingent liability in respect of hire-purchase sales guaranteed by the company, which the directors estimated would fully set off the amount of retention monies held against them. The creditors decided to confirm the voluntary liquidation of the company with Mr. N. W. Peeling, 1, Fennel Street, Manchester, and Mr. F. E. Bendall, 31, Lloyd Street, Albert Square, Manchester, as joint liquidators. A committee was also appointed consisting of Mr. E. F. Beardsmore, and the representatives of E. K. Cole, Ltd., and Midland Radio Distributors, Ltd.

Halson Radio Co., Ltd.—Winding-up voluntarily. Liquidator, Mr. G. Wallett, 61, Chaffinch Road, Beckenham.

Electrical & Radio Products, Ltd.—Meetings January 27th at 9, Basinghall Street, E.C.2, to receive an account of the winding-up by the liquidator, Mr. D. L. Honeyman.

Private Arrangements

J. F. Swallow, radio dealer, &c., Finkle Street, Richmond, Yorks.—At the meeting of the creditors the statement of affairs showed ranking liabilities of £873, of which £834 was due to the trade, while the bankers were partly secured creditors for £283, holding security valued at £245. The net assets were £542, leaving a deficiency of £331. The debtor, it was stated, had been trading on his own account for a number of years. The business during recent months had suffered through the debtor's ill-health. Recently creditors had pressed and a deed of assignment had been executed to protect the assets. Efforts had been made to sell the business as a going concern, and an offer of £500 had been obtained. Resolutions were passed in favour of the matter being dealt with under a deed of assignment to Mr. N. W. Bell, C.A., 36, Priestgate, Darlington, with a committee consisting of Mr. C. H. Baker, Leeds, and the representative of Gledson & Co., Ltd.

A. Roberts, 25/33, Church Bank, 6, Great Moor Street, and 65, Knowsley Street, all Bolton, wireless dealer, &c.—The creditors were called together recently at the offices of Percy Mason & Co., accountants, 64, Gresham Street, London, E.C. The statement of affairs showed ranking liabilities of £6,080, and in addition there were fully secured creditors for £4,168. The net assets were £2,551, leaving a deficiency of £3,529. The deficiency in the statement of affairs was attributed to the writing down of the assets, coupled with a net loss on the trading. In the absence of any offer it was decided that the matter should be dealt with under a deed of assignment to Mr. A. T. Eaves, of H. L. Price & Co., 47, Mosley Street, Manchester, and Mr. Webber, of Percy Mason & Co., as joint trustees, with a committee.

L. Ashcroft, electrical contractor, 19, Cavendish Street, Barrow-in-Furness.—The creditors met recently when the statement of affairs showed ranking liabilities of £1,339. The net assets were £253, leaving a deficiency of £1,086. It was explained that the debtor's mother was a cash creditor for £468 and she had also guaranteed the bank overdraft of £590. It was decided that subject to the debtor's mother withdrawing her claim the matter should be dealt with under a deed of assignment.

Ronnie's Radio Supplies, 158, Uxbridge Road, Shepherd's Bush, W.12.—The statement of affairs submitted at a recent meeting of the creditors disclosed liabilities of £471. The net assets were £99, leaving a deficiency of £372. An offer was made of a composition of 4s. in the £, which it was decided should be accepted.

Dissolution of Partnership

Dawson, Stook & Banwell, music and radio dealers and electrical engineers, 2, High Street, Fulham, London.—Messrs. S. J. Dawson, G. R. Stook, and O. Banwell have dissolved partnership. Mr. Dawson will attend to debts and carry on the business under the name of Dawson Bros.

Electricity Consumption in Industry

IN our August 13th issue (page 217) details were published of the consumption of electricity during 1935 of rather more than half of the trades covered by the fifth Census of Production (1935).

Below we give figures relating to the remaining trades and obtained, as before, from statistics which have been appearing fortnightly in the *Board of Trade Journal*. Owing to the inevitable overlapping of many industries the consumption given in many cases relates only to energy used so far as could be recorded separately. The returns do not take into account firms employing not more than ten persons on an average during the year.

	Generated in same works. Thous.kWh	Generated in other works under same ownership. Thous.kWh	Purchased. Thous.kWh	Total. Thous.kWh
LEATHER TRADES.				
Fellmongery	696	113	967	1,776
Leather tanning and dressing	13,427	—	30,217	43,644
Leather goods	119	23	2,353	2,495
MISCELLANEOUS TRADES.				
Rubber	14,663	40	218,803	233,506
Plastic materials, buttons and fancy articles	263	34	25,194	25,491
Linoleum and oilcloth	28,663	372	16,924	45,959
Brush	1,565	351	2,714	4,630
Manufactured abrasives	1,945	—	3,815	5,760
Incandescent mantles	153	—	407	560
Scientific instruments, appliances and apparatus	3,881	—	17,952	21,833
Musical instruments	3,550	—	5,561	9,111
Coke and by-products	32,054	84,908	37,587	154,549
Manufactured fuel	3,277	56	821	4,154
Games and toys	—	—	3,848	3,848
Sports requisites	261	1	2,396	2,658
Cinematograph film printing	—	222	1,530	1,752
BUILDING AND CONTRACTING TRADES.				
Building and contracting	5,320	256	61,709	67,285
PAPER, PRINTING AND STATIONERY TRADES.				
Paper	1,063,755	2,227	124,695	1,190,677
Wallpaper	2,296	6	2,384	4,686
Printing, bookbinding, stereotyping, engraving and kindred trades	6,268	532	89,551	96,351
Printing and publication of newspapers and periodicals	513	—	59,154	59,667
Manufactured stationery	4,296	236	25,892	30,424
Cardboard box	2,139	1,082	14,045	17,266
Pens, pencils and artists' materials	287	—	4,509	4,796
TIMBER TRADES.				
Timber (saw milling, etc.)	9,323	3	2,341	11,667
Furniture and upholstery	8,433	30	50,276	58,739
Cane and wicker furniture and basket ware	60	84	732	876
Wooden crates, cases, boxes and trunks	1,827	431	10,317	12,575
Coopering	4	167	1,125	1,296
CLOTHING TRADES.				
Tailoring, dressmaking, millinery, etc.	5,982	99	61,745	67,826
Boot and shoe manufacturing	4,279	546	40,594	45,419
Boot and shoe repairing	119	—	2,253	2,372
Hat and cap	751	—	12,250	13,001
Glove	437	49	1,313	1,799
Fur	23	—	2,484	2,507
Umbrella and walking-stick	6	66	539	611
MINES AND QUARRIES.				
Coal mines	1,330,686	522,588	774,686	2,627,960
Non-metalliferous mines (other than coal, salt and slate)	27,791	6,269	38,023	102,083
Metalliferous mines and quarries	3,326	4,518	42,300	50,144
Slate mines and quarries	2,916	—	7,576	10,492
Salt mines, brine pits and salt works	10,636	5,285	1,703	17,624
PUBLIC UTILITY SERVICES.				
Gas undertakings	66,873	—	16,670	83,543
Electricity undertakings	908,839	36,132	117,942	1,062,913
Water undertakings	16,644	1,685	87,815	106,144
Railway companies	3,573	—	104,877	108,450
Tramway and light railway companies	65	—	770	835
Canal, dock and harbour companies	6	—	1,606	1,612
Local authorities (other than gas, electricity and water undertakings)	688	—	31,338	32,026*
GOVERNMENT DEPARTMENTS.				
Admiralty:				
Naval Dockyards	—	43,435	32	43,467
Naval Ordnance Depots	44	7,005	3,128	10,177
Civil Engineering Dept.	2	342	11	355
Naval Victualling Yards	—	1	27	28
Electricity Undertakings	3,760	—	—	3,760
Flat Chart Establishment	—	—	41	41
General Post Office:				
Telegraph and Telephone Services	—	—	611	611
Other Departments	—	—	196	196
War Office:				
Ordnance Factories and Ordnance Dept. Workshops	18,322	139	3,317	21,778
Army Bakeries	—	14	17	31
Electricity Undertakings	2,174	—	—	2,174
Air Ministry:				
Royal Air Force Works	118	201	83	402
Royal Airship Works	—	—	186	186
H.M. Stationery Office	—	—	1 630	1,630
H.M. Office of Works	—	—	50	50
Ordnance Survey Dept.	—	—	151	151

* Exclusive of 816,383,000 kWh for transport purposes.

Electricity Supply

Lighting, Domestic, Power

Bradford.—NEW SWITCHGEAR.—The foundations of a new 6,600-V switch-house at the Valley power station were laid last week. The switch-house is to cost £60,000, including equipment. One section will accommodate fifteen switch units from the switch-house that was damaged by fire last year; the other will house sixteen new switch units. Besides inspecting the first 6,600-V switch-house, the gear in one-half of which is now in operation, members of the Electricity Committee saw the sites of two 33,000-V switch-houses to be built in Canal Road and Valley Road. One site is at present covered by dwellings. Near it are to be built a new control room and a cooling tower capable of cooling about 2,000,000 gall. of water hourly. Later the city electrical engineer (Mr. Thomas Roles) cut the ribbon across a new Canal Road entrance to the power station and declared it open. Using this entrance, the members of the Committee approached the scene of preparations for a large coaling depot.

Cumberland.—BORROWDALE SCHEME.—The proposed erection of an overhead line in the Borrowdale Valley is not to be proceeded with, the Buttermere Green Slate Co. having decided to renew its own generating plant, as it is unable to wait the length of time which must elapse before the line can be erected. The implementation of the scheme has been delayed by opposition on the ground that the beauty of the valley would be marred.

Dalton.—SUPPLY SCHEME.—The Lancashire Electric Power Co. has notified the Rural District Council that it proposes to extend its mains. Subject to receiving definite applications from the residents, the work will be put in hand as early as possible, but owing to other work it will be some little time before a supply will be available. The cost will be £1,480.

Dartford.—SUPPLY EXTENSION.—At a cost of £1,879 the Electricity Committee is to provide a supply to the London Paper Mills.

METER TESTING.—The Electricity Committee is to provide meter testing equipment at a cost of £750.

Dutch East Indies.—POWER SUPPLY PROGRESS.—According to a report recently issued by the Hydro-Electric Power Department of the Government the four principal State hydro-electric undertakings are those in Bandoeng Plain, West Java, Madiren and Benkoelen, the output of which in 1936 amounted to (in million kWh) 50.2, 52.5, 4.3 and 3.9 respectively.

Ebbw Vale.—SUPPLY INTERRUPTIONS.—A partial failure of the electricity supply occurred while the Council was meeting last week. The chairman of the Electricity Committee, in response to a request for an inquiry, said that an interruption in the supply on the previous Friday was due to causes over which they had no control, but the failure that evening was caused by a valve bursting at the Beaufort sub-station. It was decided to call for a report from the engineer.

Glasgow.—NEW EQUIPMENT.—At an estimated cost of £8,430, additional 20,000-V and 6,500-V switchgear and 20,000/6,500-V transformers are to be provided in Buchanan Street and Govan sub-stations in order to cope with anticipated development during the winter of 1938-39.

ELECTRICITY FOR INSTITUTION.—A special sub-committee of the Health Committee has accepted the offer of the Clyde Valley Electrical Power Co. to supply electricity to various institutions connected to its supply at a flat rate of 0.75d. per kWh (plus any extras under the company's standard coal clause), this rate including electricity for lighting, power and general purposes.

Littleborough.—POWER PLUGS IN COUNCIL HOUSES.—The Electricity Committee has in hand a scheme to provide power plugs to Council houses as soon as the Minister of Health's permission can be obtained. At a recent Council meeting it was suggested that as the electricity undertaking was making a substantial profit it should be possible to fit the power plugs and charge the cost to the undertaking. The chairman replied that the undertaking could not subsidise one section of the public and leave the others out.

London.—BERMONDSEY.—The Public Amenities Committee is to floodlight the playground in Tanner Street in order that the courts and pitches can be used for games during the winter evenings. The cost is estimated at £218.

A new electrical installation in the library portion of the Rotherhithe Town Hall, costing £544, has been recommended by the electrical engineer.

BATTERSEA.—It has been found that some consumers who hire electric cookers are not obtaining the best results owing to the use of unsuitable utensils, and the Electricity Committee is of opinion that a more complete set of equipment should be provided without extra charge. A recommendation has therefore been passed that the hire charges for electric cookers (whether under the "all-in" domestic tariff or otherwise) shall include the hire of one electric kettle, one electric iron and two saucepans.

ST. MARYLEBONE.—The Electricity Committee is to purchase meter-testing equipment at a cost of £650.

HACKNEY.—Immediately the new "Osira" luminescent lamps became available on December 1st an order was placed with the General Electric Co., Ltd., for thirty-six 400-W lamps for the lighting of Rectory Road, Hackney, and Stoke Newington Common. These, housed in G.E.C. "Di-fractor" lanterns, are in process of immediate erection. Thus Hackney may claim to be the first public lighting authority in the world to adopt these new lamps for a complete public thoroughfare lighting installation.

Luminescent street lighting in Rectory Road, Hackney

STOKE NEWINGTON.—A sum of £398 is to be spent on the overhauling of electricity meter testing apparatus and the provision of new equipment.

Mold.—REDUCED CHARGES.—Last week the Urban District Council approved a reduction in the lighting flat rate from 5d. to 4d. per kWh, to date from October last, and the institution of a ½d. two-part tariff running charge (in place of ¾d.) as from the beginning of 1938.

Middlesex.—INSTALLATION RENEWAL.—The Health Committee is to renew the electrical installation at the White Webbs Institution at a cost of £600.

New Zealand.—SURVEY OF GENERATION AND SUPPLY.—The Government Census and Statistics Department's preliminary statement on electricity generation and supply during the year ended March 31st last gives the quantity of electricity generated as nearly 1,142 million kWh, an increase of 11 per cent. Per head of the population this averaged 723 kWh, against 660 kWh in the previous year. The capacity of generating plant at the end of the period was 383,205 kVA (379,523 kVA at March 31st, 1936). Not only was there an increase from 355,975 to 371,023 in the number of retail consumers, but the kWh sold per consumer improved from 2,178 kWh to 2,308 kWh. The number of ranges advanced from 44,449 to 53,402, water heaters from 58,864 to 67,049, and milking machines from 18,026 to 20,451. The number of persons employed in the industry, including those engaged on new construction works, advanced from 3,912 in 1935-36 to 4,250 in 1936-37, the salaries and wages paid increasing from £932,356 to £1,080,122. The highest level previously recorded for persons engaged was in 1928-29, when the number of employés was 4,376, the salaries and wages paid being £1,068,830. The net capital expenditure during the year amounted to £1,459,561. The statistics reveal that the industry has set many new record levels. Broadly speaking, the Government systems, which generated 83 per cent. of the power during the year ended March 31st last, are nearing their maximum power output. However, works in progress on the North Island system, together with future extensions authorised for the South Island system, should provide sufficient generating plant to cope with the country's potential electricity demand for some time to come.

Norham (Northumberland).—ELECTRICITY SCHEME.—The ratepayers have agreed to a £110 scheme for bringing electricity to the village. Houses and streets hitherto lighted by oil lamps will be changed over to electricity.

Norwich.—MONEY FOR DEVELOPMENTS.—The City Council has agreed to apply for permission to borrow £25,000 for expenditure on meters. The Council also seeks approval of the electrical engineer's scheme for sectionalising the switchgear chamber and other apparatus at the Thorpe power station into fireproof compartments at an estimated cost of £3,400.

Oban.—ELECTRICAL DEVELOPMENT.—Reporting on the working of the electricity undertaking for the year ended May 15th last, the engineer recommends a further extension of plant, &c., in order to meet the maximum demand during the winter of 1938-39. He also reports that the Postmaster-General has made application for a supply of power for a radio-telephone station to be established near Ganavan; this is to be given subject to the granting of the necessary Fringe Order.

Oxford.—PURCHASE OF UNDERTAKING.—At the annual meeting of the Oxford Electric Co., Ltd., held recently, it was announced that an offer of £239,298 had been received from the Wessex Electricity Co., for the company's electricity undertaking. The Oxford Corporation, however, had since stated that it desired to make a bid for the undertaking.

Plymouth.—STREET LIGHTING.—Instructions for lighting improvements to be effected in two of the city's principal thoroughfares, Old Town Street and Mutley Plain, were given at the December meeting of the Electricity Committee, which also authorised the laying of new mains in six streets in Plymouth and Devonport.

Plympton.—SUPPLY TO SHAUGH.—The question of supplying electricity to Shaugh is to be further considered. At a recent Council meeting it was stated that the demand was almost 100 per cent. and that the area would probably extend considerably if the facility were granted. The Electricity and Public Lighting Committee considered that the extension, which would cost nearly £4,000, should not be undertaken unless the china clay companies took a supply for power.

Sleaford.—TUBULAR HEATING.—Although it will necessitate the renewal of the cable in Jermyn Street, an application from the Roman Catholic authorities for a supply of electricity for tubular heating (thermostatically controlled) has been granted. The tariff will be 1d. per kWh.

Stanley.—CABLES.—The Urban District Council has approved a notice from the Electrical Distribution of Yorkshire, Ltd., in respect of the laying of underground electric cables in Silver Street.

Stockton-on-Tees.—PROPOSED PARLIAMENTARY BILL.—The electors of Stockton have approved the promotion of a Bill by the Town Council seeking powers including authority to extend the electricity undertaking and to acquire compulsorily lands required for sub-stations.

Stoke-on-Trent.—EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £900 to provide an additional supply to the works of T. & R. Boote, Ltd., in Church Street, Hanley, and to improve the supply at Sneyd Green (£550). Extensions are also to be carried out at a cost of £900 to supply the new Coal Trade Offices in Winton terrace. Plant extensions are to be carried out at the High Street sub-station, Fenton, at a cost of £750.

Swindon.—NEW EQUIPMENT.—In connection with the additional plant necessary at the factory of W. D. & H. O. Wills a vote of £1,100 has been made by the Electricity Committee. Sanction is being sought by the Committee to loans of £2,000 for meter-testing equipment, and £38,350 for mains and services.

Taunton.—SUPPLY EXTENSION.—Authorisation has been given to the borough electrical engineer to proceed with a scheme for providing a supply of electricity to the Batts Park estate adjoining Trull Road, at an estimated cost of £1,500. Application is to be made for sanction to the borrowing of a further sum of £10,000 for the provision of domestic apparatus on hire.

Tynemouth.—SPECIAL TARIFF FOR BAKING OVENS.—An inquiry has been received for the supply of electricity for heating a baker's oven, and as this is an off-peak load it has been recommended that electricity shall be supplied on the following terms: A charge of 0.65d. per kWh throughout the year,

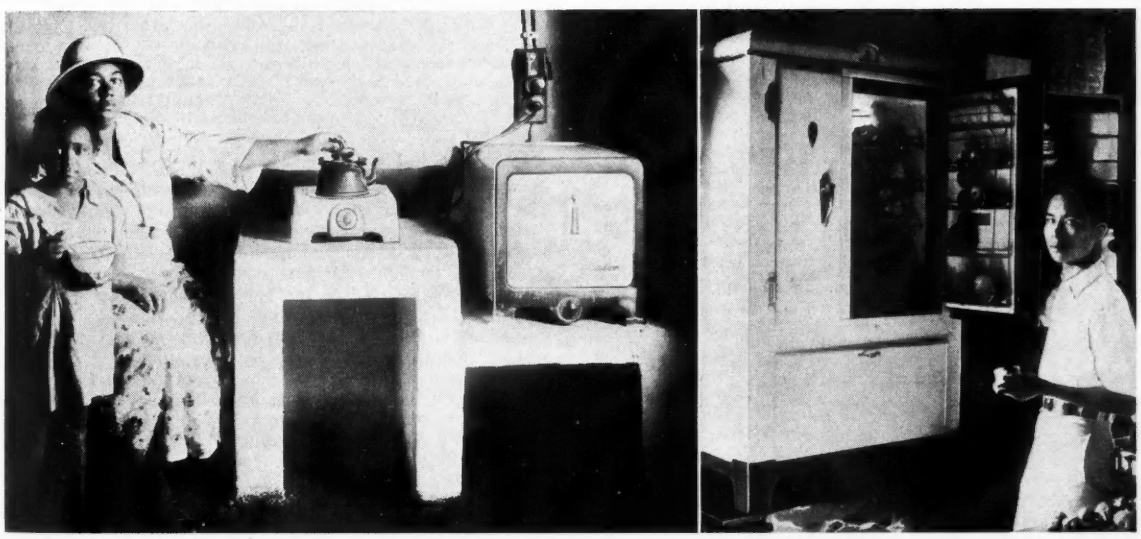
Electricity Supply in Madagascar

SOME facts concerning the development of electricity in Madagascar have recently been published. These are of particular interest as the country has only recently been electrified, the distribution system of Antananarivo being the only one in existence prior to 1930. Distribution is in the hands of two companies. The Société d'Electricité et d'Entreprise supplies the north of the island and Diego Suarez, and the Société d'Electricité et des Eaux de Madagascar operates in the central plateau and particularly at Antananarivo, Antsirabe, Fianarantsoa and the ports of Tamatave and Majunga.

Diego Suarez in the north and Majunga in the centre are supplied by steam plants, and the rest of the country obtains its supplies from hydro-electric stations. Since the installation of the distribution systems electric lighting has become general, and in the past two years an effort has been made to develop the use of domestic electrical apparatus. This campaign has met with particular success in the upper plateau, where there is a very temperate climate. Diego Suarez, Tamatave and Majunga, at a lower altitude, have a much more tropical climate, so that the type of apparatus used is somewhat different. In the plateau regions the effort has been particularly in the direction of electric space heating and water heating, and in the lower parts of the country cooking and refrigeration have been the spearhead of the campaign.

The problem of the distribution companies has been a difficult one. The climate is generally warm, but in the cooler parts firewood is extremely cheap. Further, servants' wages are low. These factors and the habits of the natives have militated against the spread of domestic electricity.

The town of Diego Suarez is a case in point. The distribution network was built in 1931 and almost immediately lighting by electricity spread to the majority of the houses. During four years this was as far as the company was able to get, and by the end of 1935 only three small hot-plates had been connected. Since then, however, the company's educational campaign, carried out particularly with a view to familiarising the natives with electricity, has effected a considerable improvement in this direction. The greatest success has been obtained with electric refrigerators. Shops also have been persuaded to introduce refrigeration, which, on account of the climate, is very beneficial. From the point of view of the colonists, electric refrigeration has permitted a development of the sale of European foods, especially butter and cheese, which were previously unobtainable on account of their rapid deterioration.



The kitchen of a native home at Diego Suarez, and (right) a large electric refrigerator

Interest in electrical apparatus is growing, not only among European settlers, but in native homes. Electrical apparatus in use in the country includes eleven ranges, 70 hot-plates and 41 ovens. Refrigerating installations are the most popular, however, there being 233 altogether in use, largely in the lower-lying towns. The plateau accounts for the greater part of the water heaters, of which there are 177.

In Diego Suarez the Spyliopoulos bakery has an electric baking oven. The hotel Chez François is provided with electric heating, hot water, and cooking, and in Antananarivo a block of ten flats is all-electric.

On the whole the distribution concerns have been making a real effort, although as yet the surface of the field for development has barely been scratched.

except from 3 p.m. to 9 p.m. on Monday, Tuesday, Thursday, and Friday of each week during the period October 1st to March 31st.

United States.—INTERNATIONAL EXPOSITION LIGHTING.—Illumination plans for the Golden Gate International Exposition from February 18th to December 2nd, 1939, are estimated to involve a consumption of 40 million kWh, states the official organ of the American I.E.E. The site of the exposition is a 400-acre island created by dredging near the mid-point of the San Francisco-Oakland Bay Bridge. Power will be delivered at a 16,000-kVA sub-station on this island through three submarine cables, each 9,000 ft. long. A committee of illumination engineers is dealing with the exterior illumination plans, which call for extensive use of the new fluorescent tubes.

Traction

Gateshead.—ACQUISITION OF TRAMWAYS UNDERTAKING.—At a recent meeting of local government electors at Gateshead it was decided to support the Bill promoted by the Town Council to take over the undertaking of the Gateshead and District Tramways Co. and to introduce trolley-buses on routes in the area. It was announced that the Tramways Co. is also promoting a Bill which proposes trolley-bus services on the present tram routes only.

Italy.—ELECTRIC VEHICLE CONSTRUCTION.—The Fiat Co., of Turin, the largest manufacturers of petrol and oil engine motor vehicles in Italy, have recently commenced the production of electric vans and trucks. One for loads up to 2½ tons was shown at the recent International Motor Exhibition in Milan.

London.—" TUBE " IMPROVEMENTS.—A deputation, which included the Mayor of Surbiton, last week outlined the grievances of travellers on the Waterloo and City Tube Railway to Mr. R. Holland-Martin, chairman of the Southern Railway Co., emphasising the condition of the rolling stock, the long waits during rush hours, and the objections to the long ramp at the City end up and down which all passengers had to walk. Mr. Holland-Martin pointed out that the railway was one of the first tubes, having been built in 1898, and it consequently lacked the benefits of later experience. He stated that the directors had approved the construction of completely new rolling stock which would practically double the existing carrying capacity; the renewal of signalling arrangements, cables and switchgear; the placing of the conductor rail in a new position; the welding of rail joints and the provision of noise-absorbing shields. The improvements would, he said, be put in hand at once. He could give no promise in regard to escalators at the Bank. It had become necessary to review the question with a view to installing escalators at a point most advantageous to the whole layout at the Bank, and it was hoped to report on the matter shortly.

Switzerland.—ELECTRIC SNOW PLOUGHS.—The authorities of the Jungfrau electric railway which runs to the summit of the Jungfraujoch, 11,330 ft. above sea level, have recently put in operation a metre-gauge electric snow plough for use on the open section of the railway between Little Scheidegg and the Eiger Glacier, which has a maximum gradient of 1 in 4, the remaining portion of the line being in a tunnel inside the mountain. The plough is driven by two motors, cascade connected so that the speed can be regulated between 0.9 and 2½ m.p.h. when the snow ploughs are in operation. During the time the machine has so far been in operation it has successfully removed snow reaching a depth of over 6ft., the volume dealt with under these conditions being nearly 5,300 cu. ft. per min.

Communications

Belgium.—NEW RADIO STATION.—A radio station to transmit in German is to be set up shortly, states *Reuter*. It will be situated in Eupen.

Canada.—NEW TRANSMITTER.—The Canadian Broadcasting Corporation's new transmitting station at Montreal which has just been opened is by far the most powerful in the Dominion, states the Ottawa correspondent of *The Times*. It is designed to serve not only the population of Quebec, but also the numerous French Canadians now living in the United States who want distinctive Canadian programmes in their mother tongue.

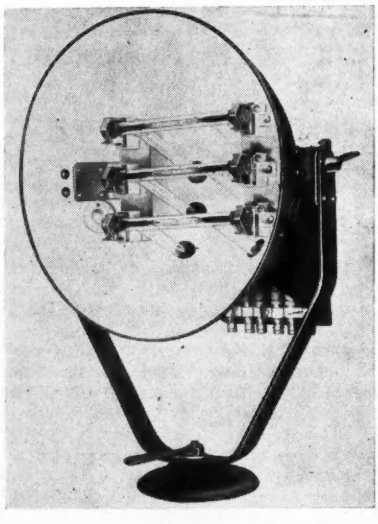
Rumania.—TELEPHONE PROGRESS.—According to the *Journal des Télécommunications* good progress is being made by the Societatea Romana de Telefoane which was formed seven years ago to operate the telephone system in Rumania. During 1936 nearly 4,970 miles of new lines were erected in the country, bringing the total up to about 72,020 miles. During last year direct telephone communication from Bucharest was established with London, Paris, Vienna, Berlin and Istanbul.

Sweden.—NEW TELEPHONE CABLE TO FINLAND.—An agreement has just been made between the Swedish and Finnish Telegraph Departments for the laying of a second submarine telephone cable between the two countries. The principal portion of the cable, between the Aland Islands and Abo, and the necessary repeater stations on that part, will be delivered by the Swedish L. M. Ericsson Co. in conjunction with a Finnish cable factory, and the section of the cable between Sweden and Aland has been ordered from German cable works. The Aland-Abo submarine cable will allow of thirty-two simultaneous conversations over two pairs of wire. The new cable, which will cost about 30 million Finnish marks, is planned to be ready for use at the end of next year.

Discharge Lamps for Photography

THE possibilities offered by electric discharge lamps for photographic work and projection purposes were discussed and demonstrated before the Kinematographic Section of the Royal Photographic Society last week by Mr. van Dijk, of Philips' Lamp Works, Eindhoven, and Mr. F. Ziegler, A.R.P.S., photographer to the Court of Holland.

Mr. van Dijk described the research and experiments which had been undertaken. With the aid of demonstration lamps and equipment, lantern slides and illustrations, he discussed the spectral composition of electric discharge light and showed how suitable combinations of sodium and mercury lamps give a light which renders perfect tone values in photographic results. The very high lumen/watt efficiency of electric discharge lamps was shown to reduce studio lighting loads.



A photographic unit comprising three 2,000-W water-cooled mercury lamps

For film studio lighting, Mr. van Dijk demonstrated the exceptional possibilities offered by water-cooled, high-brightness mercury discharge lamps, and a film was shown illustrating the results of various tests made under studio conditions. The application of these small and intensely bright water-cooled lamps to projection work was then described, and illustrations of experimental units, using 500-W or 1,000-W water-cooled mercury lamps for film projection, were shown.

Mr. Ziegler referred to the fact that the colour rendering given by sensitive materials has been enormously improved during recent years, but suggested that the question of lighting was one which similarly deserved close study. His points were illustrated by various still photographs taken under different combinations of lighting by sodium and mercury discharge lamps, and Mr. Ziegler expressed the opinion that a general flood of light from sodium lamps, supplemented by spot lighting from the mercury type, formed an ideal medium of studio illumination.

Mr. Ziegler showed examples of typical photos taken with the methods of lighting he described. He also showed a film illustrating the actual "Philora" sodium and mercury discharge lighting equipment which has been specially developed for him, and which he now uses exclusively.

Among the actual lamps exhibited during the lecture were the following types:—(a) A unit consisting of three experimental 2,000-W "Philora" water-cooled high-pressure mercury lamps, giving 360,000 lumens. The light source of each lamp has a brightness of 33,000 candles per sq. cm. and an efficiency of 58.5 lumens per watt with a maximum intensity of 12,000 c.p. (b) A 500-W SP. "Philora" water-cooled high brightness mercury lamp giving 35,000 lumens. The light source is 12.5 mm. × 1 mm. and has a brightness of 33,000 candles per sq. cm. with a maximum intensity of 3,500 c.p. An initial efficiency of 63.5 lumens per watt is obtained. (c) A 150-W "Philora" sodium lamp, giving 9,600 lumens, an efficiency of 64 lumens per watt and a brightness of 10 candles per sq. cm. (d) A 250-W "Philora" mercury lamp giving 9,000 lumens, with an efficiency of 36 lumens per watt and a brightness of 100 candles per sq. cm. (e) An 80-W "Philora" mercury lamp, giving 3,040 lumens, with an efficiency of 38 lumens per watt and a brightness of 1,100 candles per sq. cm.

Contract Information

When "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Aberystwyth.—January 18th. Electricity Department. Kiosks and sub-station equipment. (December 17th.)

Australia.—MELBOURNE.—February 7th. City Council. Two 10,000-kVA transformers. (T. 31982/37.)*

February 16th. Melbourne & Metropolitan Tramways Board. One 500-kW rotary convertor, one 550-kVA transformer, current limiter and spares. (T.Y. 32023/37.)*

Birmingham.—January 12th. Salvage and Stables Committee. Forty-six lead plate batteries for electric vehicles. (December 24th.)

Bradford.—January 13th. Corporation. Control batteries for sub-stations. (See this issue.)

Bridgnorth.—January 8th. Town Council. Electric pumping machinery, comprising two sets of vertical-spindle borehole centrifugal pumps and booster pumps, each set driven on the same vertical shaft and to deliver 25,000 gal. per hr.; two sets of electrically driven horizontal booster pumping sets, each comprising horizontal-spindle type multi-stage centrifugal pump and motor and to deliver 3,000 gal. per hr.; also piping and air compressor. W. H. Radford & Son, Albion Chambers, King Street, Nottingham (deposit £3 3s.).

Brierley Hill.—January 27th. U.D.C. One centrifugal-type sewage pump, capable of delivering 20,000 gal. per hr., together with electric motor and equipment and accessories, for the Wordsley pumping station, near Stourbridge. Fiddian & Deeley, Council's engineers, 13, Church Street, Stourbridge (deposit £3 3s.).

Cardiff.—January 17th. Electricity Department. 33,000-V and other p.i. cables and one 7-panel, 6,600-V, 350,000-kVA rupturing capacity switchboard. (December 24th.)

Cheadle and Gatley.—January 17th. U.D.C. Electricity Department. 6.6-kV switchgear and 500-kVA oil-cooled transformer with manually operated off-load tap changer. (See this issue.)

Chelmsford.—January 11th. R.D.C. Two centrifugal pumps and electric motors, with automatic control. Lemon & Blizard, 25, Victoria Street, London, S.W.1 (deposit £2 2s.).

Darlington.—January 17th. Borough Council. Electrically driven centrifugal sludge pumps, dual screen raking gear, electrically driven sludge evacuator for rectangular sedimentation tanks and revolving sewage distributors. Borough surveyor, Town Hall.

Dartford.—January 22nd. Borough Council. Electric van. (December 24th.) Meter testing equipment. (See this issue.)

Eastbourne.—January 14th. Electricity Committee. Electrical materials for twelve months; also wiring for hire and hire-purchase apparatus for assisted wiring installations. (December 17th.)

Egypt.—CAIRO.—January 17th. Ministry of Public Works (Mechanical and Electrical Department). One 25-kW oil-engine driven generating set, one 5-kW 220-V d.c. generator, switchboard, cable, accessories, &c., for the extension of the power station at the Valley of the Kings, Luxor. (T. 31725/37.)*

Epsom and Ewell.—January 17th. Electricity Department. Oil-immersed transformers and h.v. switchgear. (December 24th.)

Fife.—January 5th. County Council. Electric lighting at Kincardine-on-Forth housing estate. C. R. Douglas & Son, East Port, Dunfermline (deposit £1 1s.).

Hemsworth.—January 4th. R.D.C. Electric lighting installations at sixty-two houses on the rehousing estate at South Kirkby. W. T. Lynam, engineer and surveyor to the Council. Market Chambers (deposit £2 2s.).

Heston and Isleworth.—January 6th. Electricity Department. Cables, switchgear, protective relays and potential transformers. (December 24th.)

Irish Free State.—DUBLIN.—January 25th. Electricity Supply Board. Twelve months' supply of p.i. cables. (See this issue.)

Kirkcaldy.—January 12th. Burgh Council. Electric vehicle. (See this issue.)

Leeds.—January 17th. Housing Committee. Electric wiring of houses, cottage flats, shops and garages on various estates. R. A. H. Livett, housing director, 26, Great George Street (deposit £2).

Liverpool.—January 21st. Corporation. Electrical supplies for twelve months. (See this issue.)

London.—BETHNAL GREEN.—January 14th. Electricity Department. Electric van. (December 24th.)

Manchester.—January 5th. Highways Committee. 183 one-way illuminated (external floodlight) traffic signs for one-way traffic scheme. Highways Department (District Surveyor's Office), Town Hall (deposit £1 1s. to the city treasurer).

January 10th. Electricity Committee. Electrically driven boiler feed water, drain water, and oil-flushing pumps for the Stuart Street and Barton power stations; and one 200-kW and one 10-kW mercury arc rectifier equipments for consumers' sub-station. (See this issue.)

Merton and Morden.—January 12th. U.D.C. Vehicle actuated traffic signals at junction of Merton High Street and Haydons Road. (See this issue.)

Newport (MON).—January 10th. Corporation. Cable. (See this issue.)

New Zealand.—WELLINGTON.—January 18th. Public Works Department. One outdoor-type, 100-A, 11,000-V, pole-mounted oil-circuit breaker, complete with shunt trip coil and current transformers. &c. (T. 31750/37.)*

February 22nd. Post and Telegraph Department. Insulated copper wire. (T. 31758/37.)* Copper wire and binders. (T. 31986/37.)*

February 14th. Cable. (T. 31840/37.)*

February 25th. Cable. (T. 31756/37.)*

CHRISTCHURCH.—February 15th. Electricity Department. Sub-station switchgear. (T. 3753/37.)*

Nuneaton.—January 31st. Corporation. D.c. and a.c. meter-testing equipment and instruments. (See this issue.)

Pembroke.—January 4th. Borough Council. Electrically driven unchokeable, centrifugal type, automatically operated pumping sets, all in duplicate, and one oil-engine driven standby unit, together with incidental works, at Pembroke and Pembroke Dock. A. P. J. Cotterell & Son, 54, Victoria Street, London, S.W.1 (deposit £2 2s.).

Salford.—January 12th. City Council. One 15,000-kVA transformer, fitted with automatic on-load tap changing equipment. (December 17th.)

January 6th. Twelve months' supply of traction lamps and tramcar accessories. General manager, Transport Offices, Frederick Road.

January 14th. One 75-kW mercury-arc rectifier. (December 24th.)

Shipley.—January 8th. U.D.C. Electric lighting in thirty-four houses. H. Dawson, surveyor and architect, Town Hall.

South Africa.—JOHANNESBURG.—January 19th. City Council. 120 300-A and thirty 100-A distribution fuse units, equipped with glazed porcelain cartridge fuse carriers, and 504 cartridge fuses, together with spare fuse carriers and metering sockets or test plugs. (T. 31603/37.)*

PRETORIA.—January 20th. Union Tender and Supplies Board. 150-kVA transformer, l.v. switchboard, h.v. switchgear and cable. (T.Y. 31597/37.)*

January 13th. Public Works Department. L.v. switchgear. (T. 31863/37.)*

RAWSONVILLE (CAPE PROVINCE).—January 8th. Village Management Board. Electric lighting power station and distribution network. (T. 31851/37.)*

PORT ELIZABETH.—January 27th. Municipality. One 4,000-kVA transformer, ten 22,000-V, three-phase circuit-breakers and one ring main unit; also l.c. and armoured cable, cable end boxes, joints, &c. (T.Y. 31398/37.)*

February 24th. One 12,500-kW steam turbo generator, with air and oil coolers; condenser; circulating, air and condensate pumps; pipes, valves and steelwork. (T. 31887/37.)*

DURBAN.—January 21st. Electricity Department. Six e.h.v. metal-clad, three-phase switch panels and six single- or two three-phase reactors. (T.Y. 31591/37.)* Six e.h.v. pedestal-type, metal-clad switch panels. (T.Y. 31854/37.)*

January 7th. City Council. Four electric carcase saws for the municipal abattoir. (T. 31734/37.)*

January 21st. General Stores Department. Cadmium-copper trolley wire. (T. 32041/37.)*

Southampton. — January 18th. Electricity Department. Motor-driven boiler feed pump. (December 24th.)

Uruguay.—MONTEVIDEO.—January 28th. State Electricity Supply and Telephones Administration. Twenty-six three-phase, oil-cooled, static transformers. (T.Y. 31390/37.)*

Walton and Weybridge.—January 10th. U.D.C. Electricity Department. One transformer kiosk, e.h.v. switchgear and ring main controller; also l.v. feeder pillars and two 300-kVA transformers. (December 17th.)

Whitworth.—January 10th. U.D.C. Electricity Department. Sub-station control switchgear to operate at 6.6-kV, consisting initially of five panels with truck-type cubicle; 6.6-kV p.i. l.c. cable; and alterations to existing 6.6-kV feeders. (December 24th.)

Worthing.—January 3rd. Borough Council. Street lighting equipment, including concrete lamp columns and time switches. (December 17th.)

---

* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Bolton.—Education Committee. Accepted. Electrical services for new Technical College.—Engineering Service Co.

Darlington.—Town Council. Accepted. Electrical installation at the offices and stores of the Hundens depôt.—Newman & Watson.

Glasgow.—Gas Supply Committee. Accepted. Internal telephone system in the Gas Department (£205).—Pioneer Private Telephone Co.

Greenock.—Corporation. Accepted. Electrical work at new block at the Smithston Hospital (£149).—Kennedy, Stark & Co.

Hull.—Telephones Committee. Accepted. L.c. cable (£740).—B.I. Cables.

Ilford.—Electricity Committee. Recommended. Oil filter equipment (£212).—Metafiltration Co. Two electric vehicles (£631).—Met.-Vick. Elecl. Co. 500-kVA transformer (£520).—Ferranti, Ltd. 500-kVA transformer (£530).—British Electric Transformer Co.

London.—ST. MARYLEBONE.—Electricity Committee. Recommended. Transformers for twelve months.—B.T.H.; British Electric Transformer Co.

ST. PANCRAS.—Contracts Committee. Recommended. Traffic signals at Euston Road (£709).—Siemens and General Electric Railway Signal Co.

STOKE NEWINGTON.—Electricity Committee. Recommended. One 5/6-cwt. electric vehicle (£187) and one 20/25-cwt. electric vehicle (£245), without batteries.—Partridge, Wilson & Co.

Sutton Coldfield.—Education Committee. Accepted. Electrical installation at Reddicap Heath school.—I. Barrett & Co.

Forthcoming Events

Institution of Electrical Engineers.—Thursday, January 6th. Institution, London, W.C.2. 6 p.m. "Safeguards against Interruptions of Supply." Messrs. H. W. Clothier, B. H. Leeson and H. Leyburn.

North Midland Centre.—Tuesday, January 4th. Hotel Metropole, Leeds. 7 p.m. Particulars to be announced.

North-Western Centre.—Tuesday, January 4th. Engineers' Club, Manchester. 7.15 p.m. Discussion on "Electrical Engineering Education." To be opened by Prof. C. L. Fortescue, Col. H. C. Fraser, and Mr. F. H. Clough.

Tees-Side Sub-Centre.—Wednesday, January 5th. Cleveland Technical Institute, Middlesbrough. 6.45 p.m. Particulars to be announced.

Wireless Section.—Wednesday, January 5th. Institution, London, W.C.2. 6 p.m. "A Theory of Fluctuation Noise." Mr. D. A. Bell.

Meter and Instrument Section.—Friday, January 7th. Institution, London, W.C.2. 7 p.m. "The Calibration of Sphere Gaps with Impulse Voltages." Messrs. R. Davis and G. W. Bowdler. "The Celibration of the Sphere Gap for Voltage Measurement up to One Million Volts (Effective) at Fifty Cycles." Messrs. F. S. Edwards and J. F. Smee.

Physical Society.—Tuesday, January 4th to Thursday, January 6th. Imperial College of Science and Technology, London, S.W.7. Annual exhibition.

Institution of Electronics.—Wednesday, January 5th. 75, Gloucester Place, London, W.1. 7.30 p.m. Annual meeting.

Institution of Heating and Ventilating Engineers.—Wednesday, January 5th. Institution of Mechanical Engineers, London, S.W.1. 7 p.m. "Air Conditioning Factors." Mr. T. Chester.

Junior Institution of Engineers.—Friday, January 7th. 39, Victoria Street, London, S.W.1. 7.30 p.m. Informal meeting. Discussion on "Engineering Topics."

Association of Mining Electrical Engineers (*South Wales Branch*).—Saturday, January 8th. South Wales Institute of Engineers, Cardiff. 6 p.m. "Reconditioning of Boiler Feedwater, with Particular Reference to Steam Purity as Affecting Deposit and Corrosion in Turbines." Mr. G. S. Irving.

Notes

Compensation for Displacement

The December *Electrical Power Engineer* (the official organ of the E.P.E.A.) gives particulars of an award to two members formerly employed by the Birmingham Corporation on account of loss of employment. This takes the unusual form of a regular annual payment for life based upon their actual and potential service and their average salary during their last three years of employment. In one case the claimant had twenty-nine years' service and could have gone on for another nine years, making a total of thirty-eight years. His average salary was £371, and he was therefore awarded 38/60ths per annum, or £236. In the other case the total number of years entering into the calculation was thirty (twenty actual and ten potential). The claimant was awarded 30/60ths of his average salary of £371, equivalent to £186 per annum. As a rule, compensation is awarded in the form of a lump sum calculated in accordance with the Treasury Regulations.

The Standard of Installation Work

At an informal meeting of the Institution of Electrical Engineers held on December 20th, under the chairmanship of Mr. Forbes Jackson, a discussion on "Do Domestic Appliances of To-day Properly Serve Their Uses?" was opened by Mr. R. W. Minter. The subject was of considerable interest and attracted a good meeting, which included several visitors from the E.A.W. Criticism ranged over the wiring and the whole equipment of an all-electric house, but the charges were very largely directed against inferior workmanship and materials for which, said Mr. Minter, concerns of established reputation were sometimes responsible. A good deal of the questionable work or apparatus to be met with was considered to be due to the desire to serve the primary demand of most users, namely, cheapness, but Mr. Minter would not allow this freedom. He thought manufacturers could create a demand for superior appliances. He said that the electrical industry did not begin where its forerunners left off nor had the age-old crafts eliminated defects that could be found in much of the workmanship and design of the electrical appliances of to-day.

Liquid Culture

In a recent address to members of the Manchester branch of the Electrical Association for Women Mr. Allan Monkhouse gave an account of the way in which electricity is now being applied to horticultural work. In the course of his remarks he emphasised the seemingly great possibilities of growing flowers and vegetables in electrically heated nutrient solutions, without soil. Details were given of what had already been accomplished in this direction and Mr. Monkhouse outlined the work which had been done this summer under his supervision by the Electro-Horticultural Equipment Co., Ltd., at Harpenden, Herts. It was also arranged that the restaurant at which luncheon was served should prepare a salad in which 60 tomatoes grown in liquid culture tanks were used, for the first time publicly in this country. The accompanying illustration shows one of the plants which have been grown in this way this year. It was planted on June 11th and the photograph was taken twelve weeks later, after a considerable crop had already been picked. Also, it was arranged with Mr. C. M. Shaw, city electrical engineer of Worcester, to display at an electrical exhibition at Worcester a tank of tomatoes growing in this manner. This tank was only planted on September 14th, but on October 8th the plants had already reached 2 ft. 6 in. in height and were showing fruit. The methods employed are not restricted to tomatoes and are at the present time being succesfully applied to the growing of chrysanthemums, bulbs and a number of other plants.

A tomato plant grown by liquid culture

Electricity Supply in Portugal

A REPORT recently issued by Mr. Ferreira Dias, chief engineer to the Portuguese National Electrification Council, shows that at the end of 1936 there were 635 generating stations in the country, with a total installed capacity of 261,825 kW, as compared with 603 and 233,427 kW, respectively, at the end of 1935. Of these, 100, representing 68,142 kWh, were hydro-electric. Stations engaged in providing a supply to the public and for traction purposes numbered 176 (197,858 kW), while 459 (63,967 kWh) were privately owned.

Most of the increase of about 28,000 kW in installed capacity during 1936 was accounted for by the second new turbo-generator set of 18,900 kVA at the plant of the Companhias Reunida Gas e Electricidade in Lisbon, a new 8,000-kVA set at the Canicos central station of the Companhia Hidro-Electrica da Varosa, and one of 1,750 kVA at the Ponte de Jugsis plant of the Companhia Hidro-Electrica da Serra da Estrela. The majority of the plants in Portugal are of relatively small size, there being only eight of over 5,000 kW engaged in public supply.

The three principal undertakings in Portugal are the Companhia Reunida Gas e Electricidade, of Lisbon, with an annual output of 87.8 million kWh, the Electrica da Lima e Uniao Portugesa with 75 million kWh, and the Companhia Carris de Ferro, Lisbon, with 27.3 million kWh. The total output of electricity in the country during 1936 is given as 369.9 million kWh, an increase of about 4.02 per cent. over the previous year. Hydro-electric plants were responsible for 132 million kWh, or 35 per cent. of the total, and thermal stations for 238 million kWh. The number of consumers increased from 26,000 to 283,761.

The areas of greatest consumption were the Lisbon district (110.5 million kWh) and Oporto (84 million kWh). The textile industry consumed 63.4 million kWh, the pottery and building trades 29.3 million kWh, food preparation apparatus 24.4 million kWh, metallurgical and mechanical industries 15.1 million kWh, water pumping-plant 12.6 million kWh, the mining industry 11 million kWh, the chemical industry 9.6 million kWh, and the paper trades 5.9 million kWh. A further table shows that of the 6,360,000 population of the country electricity supplies were available to 3,258,294 people. The annual consumption per person to whom public supply was available ranged from 11 kWh in the province of Braganca to 125 kWh in the Lisbon area and 112 kWh in the Oporto district; the average for the whole country was only 76.3 kWh a year, this representing a fractional decline as compared with 1935.

As regards distribution, there was approximately 2,692 miles of high-voltage lines in Portugal at the end of 1936. The 2,408 miles of overhead line included 1,778 miles operated at up to 25 kV, 376 miles between 25 and 50 kV, and 254 miles at over 50 kV, the bulk being supported on steel masts and the remainder on ferro-concrete masts or wooden poles.

There are only six electric tramway and local railway undertakings in the country—two municipal and four privately owned—with a total track length of 230 miles.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. J. G. Doran, electrical engineer to the Bermondsey Metropolitan Borough Council, is retiring. Mr. Doran entered the service of the Council as chief assistant electrical engineer in November 1904, and became borough electrical engineer in May, 1928. **Mr. B. C. Ward,** deputy borough electrical engineer, has been appointed to succeed Mr. Doran and will take up his new duties on January 5th.

Mr. Frank Forrest, M.Inst.C.E., M.I.E.E., M.I.Mech.E., city electrical engineer, Birmingham, vice-president of the

[*Lafayette*

[*Elliott & Fry.*

Mr. and Mrs. Frank Forrest

I.M.E.A., and **Mrs. Pender Chalmers,** vice-chairman of the E.A.W., were married at Chelsea on December 23rd in the presence of a few friends.

Professor E. Branly, the inventor of the coherer bearing his name, has been awarded the Grand Cross of the Legion of Honour.

Mr. J. W. Ibbotson, of Sheffield, has been appointed assistant consumers' engineer to the Swinton and Pendlebury Electricity Department, at a commencing salary of £300 per annum.

Prof. R. V. Southwell, F.R.S., has been appointed president of Section G (Engineering) of the British Association, the annual meeting of which will be held next year at Cambridge from August 17th to 24th.

[*Lafayette*

Mr. W. T. Tallent-Bateman, who, as we reported in our last issue, is sailing for South Africa next month to represent the interests of Ferguson, Pailin, Ltd., there

Mr. A. G. McDonald, Middlesbrough area engineer of the Post Office, has been appointed engineer to the South-Western section of the London District. Mr. McDonald went to Middlesbrough from Newcastle three years ago, and during his stay on Tees-side one of his main tasks has been the extension of the main trunk and junction underground cables in the district at a cost of £250,000. A presentation has been made by officials, the gift being presented by Captain C. A. Robertson, telephone manager.

At a gathering of 150 representatives of the electrical industry at Newcastle-on-Tyne last week a gold cigarette case was presented to **Mr. D. Maxwell Buist,** of the Central Electricity Board (North-Eastern Area), who has received an important post with the British Electrical and Allied Manufacturers' Association. Mr. L. E. Mold, of A. Reyrolle & Co., Ltd., made the presentation. Colonel S. E. Monkhouse, general manager of the North-Eastern Electric Supply Co., Ltd., who presided, referred to the wide circle of friends Mr. Buist had made at Newcastle during his eight years there. Mr. Buist takes up his new duties on January 1st.

Mr. F. J. Cole, of Darwen, has been appointed electrical engineer and manager of the Shipley Urban District Council's electricity undertaking at a salary of £600 per annum, rising to £650.

Mr. J. T. Clements, general foreman at the Ealing Corporation electricity works retired recently after forty years' service with the Electricity Department, and on December 17th Mr. R. Birt, the borough electrical engineer, presented him with an inscribed gold watch and also a fireside chair for Mrs. Clements, on behalf of the officers, staff and employés of the Electricity Department. Mr. Birt paid tribute to the services rendered by Mr. Clements, and he was supported by Councillor J. D. Knight, the foreman borough electrical engineer. Mr. Clements suitably replied.

Obituary

Mr. V. Broadhurst.—The death is reported, at the age of fifty-one, of Mr. Victor Broadbent, managing director of T. W. Broadbent, Ltd., electrical engineers, of Huddersfield. Mr. Broadbent was a member of the Huddersfield sub-branch of the Electrical Contractors' Association.

Mr. R. L. Gamlen, O.B.E., M.I.E.E., whose death was reported in our last issue, was born in 1874 and was educated at Charterhouse and the Central Institute, South Kensington, of the City and Guilds of London. After a period at Faraday House he was with the Western Electric Fitting Co., the Brighton and Hove Electric Supply, and the Blackpool Corporation Electricity Supply and Tramway Department, first as an engineer in the Tramway Department, before the general supply was given, and then in the power house, of which he was the clerk of the works and also assisted in the erection of the plant. Later he became a mains superintendent, and on leaving Blackpool was appointed London superintendent for the British Insulated Wire Co. In 1897 he was appointed engineer and manager of the Bromley (Kent) and Chislehurst Electric Power Companies, erecting the power house and starting the concern, which he managed for six years. He became chief engineer and manager of the Lancashire Electric Power Co. in 1903, and was at that time president of the Society of Power Company Officials. Mr. Gamlen took up an appointment as chief engineer of all collieries in India of Bird & Co., and three years later joined the Hyderabad Government as Mint-Master, becoming also director of the Hyderabad Electricity Department, which position he held until his retirement in 1935. While in Hyderabad he was also the director of the Industries and Commerce Department and the principal of the Osmania Central Technical Institute at Hyderabad. On his retirement he went to live in Cyprus.

Mr. J. Goodman.—We regret to learn of the death of Mr. Joseph Goodman, of the General Electric Co., Ltd., which occurred suddenly at his home at Sutton Coldfield on December 22nd, in his fifty-fifth year. Receiving his early training at Faraday House, Mr. Goodman, after a period of workshop experience, joined the staff of the British Electric Transformer Co., Ltd., with whom he was associated for over twenty years, attaining the position of chief transformer designer. In 1928 he was appointed chief engineer of the Transformer Department at the G.E.C. Witton Engineering Works and held this position till the time of his death. He accomplished much valuable work in the transformer field, particularly with regard to the design of the large transformers required for the grid. For many years he was an associate member both of the I.E.E. and the I.Mech.E., and also of the American I.E.E.

The late Mr. J. Goodman

Mr. Basil Gee.—Electrical men who were in what we may perhaps be permitted to describe as the more immediate circle of the ELECTRICAL REVIEW in the very early 'nineties of last century—its Paternoster Row days—will have read with regret of the death, which occurred suddenly on December 21st at the age of seventy-eight years, of "Basil Gee, husband of Mary Ann Gee."

Mr. G. E. Watmough, for many years rolling stock engineer to the Leeds City Council Tramways, died suddenly on December 22nd at the age of seventy-seven. He retired from the tramway service about eight years ago.

Mr. D. Lambert.—The death is reported of Mr. David Lambert, for many years an inspector of telegraph and telephone lines with the G.P.O., Kirkcaldy, which occurred on December 20th at his home in Kirkcaldy. Mr. Lambert retired some years ago.

Mr. J. P. Price.—The death occurred on December 24th of Mr. Joseph Paul Price, M.I.E.E., of Croydon, a former member of the staff of the G.P.O. Engineering Department, Croydon.

Will.—Mr. E. C. Daubeny, of 1c, The Mansions, Earls Court Road, S.W., electrical engineer, left £23,589, with net personalty £23,521.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Campbell & Gifford, Ltd.—Private company. Registered December 22nd. Capital, £12,000. Objects: To acquire the business carried on by D. F. Campbell and W. S. Gifford, and to carry on the business of consulting engineers, contractors, builders, civil, electrical and general engineers, &c. The directors are: D. F. Campbell, 231, Cromwell Mansions, Cromwell Road, S.W.5, and W. S. Gifford, St. Mary's House, Weybridge, Surrey. Registered office: 17, Victoria Street, S.W.1.

F. H. Hellyar, Ltd.—Private company. Registered December 21st. Capital, £500. Objects: To carry on the business of electrical engineers, contractors, merchants, radio manufacturers, &c. The subscribers are: F. H. Hellyar and M. E. Hellyar, both of 29, Princes Avenue, W.3. Secretary: F. H. Hellyar.

Electro-Chemical Research Laboratories, Ltd.—Private company. Registered December 21st. Capital, £1,000. Objects: To carry on the business of proprietors of research laboratories, inventors, metallurgists, analysts, assayers, electricians, engineers, &c. The directors are: F. Eisner, 70, Ivor Court, Gloucester Place, N.W.1, and H. T. M. Roberts, 24a, Cannon Hill Lane, Merton Park, S.W.20. Registered office: Central House, Upper Woburn Place, W.C.1.

F. S. Salisbury, Ltd.—Private company. Registered December 20th. Capital, £1,000. Objects: To acquire the business of an electrical and radio engineer and dealer now carried on by F. S. Salisbury at 71, King Street, Wallasey, Ches. The directors are F. S. Salisbury and Ada F. Salisbury, both of 71, King Street, Wallasey, Ches. Registered office: 71, King Street, Wallasey, Ches.

Southern Distributors, Ltd.—Private company. Registered December 21st. Capital, £100. Objects: To carry on business as manufacturers of and dealers in accumulators, batteries and fluids and acids therefor, motor dynamos, armatures, &c. The subscribers are: C. S. Staniland, Fallow Court, St. George's Hill, Weybridge, and Mrs. M. E. Walker, By the Hedge, Weybridge Park, Weybridge. Secretary: J. W. Betchley, 18, High Street, Walton-on-Thames.

Blakeley, Lloyd & Co., Ltd.—Private company. Registered December 22nd. Capital, £2,000. Objects: To acquire the business of salesmen and dealers in electric clocks, appliances and apparatus heretofore carried on by W. Blakeley and J. W. Lloyd trading as Jay-Bee Sales Co. at 465, Ecclesall Road, Sheffield, 11. The directors are: W. Blakeley, 100, Totley Brook Road, Sheffield, J. W. Lloyd, 22, Faulkland Road, Sheffield, and two others.

Record Finance Co., Ltd.—Private company. Registered December 21st. Capital, £100. Objects: To carry on the business of factors of and dealers in and letters on hire of all kinds of electrical, radio and television apparatus, &c. The subscribers are: M. A. Buch, 82, Mickleton Road, Coventry, and A. G. Kyrke, 26, St. Patrick's Road, Coventry. E. F. Buch is permanent governing director. Solicitors: R. A. Rotherham & Co., 38, Bailey Lane, Coventry.

Electrical Appliances (Bolton), Ltd.—Private company. Registered December 22nd. Capital, £1,000. Objects: To carry on business as retail dealers in electrical appliances of every kind for domestic use, &c. The directors are: R. Carruthers, 72, Bury Street, Radcliffe, F. Gill, 39, Kylemore Avenue, Bolton, and N. Gill, 93, Sapling Road, Bolton. Registered office: 317, Dean Road, Bolton.

Wireless Hall, Ltd.—Private company. Registered December 21st. Capital, £1,000. Objects: To acquire the business of a radio retailer and general engineer carried on by M. A. Buch at Lower Ford Street, Coventry. The subscribers (each with one share) are: M. A. Buch, 82, Mickleton Road, Coventry, and A. G. Kyrke, 26, St. Patricks Road, Coventry. M. A. Buch is governing director for life. Solicitors: R. A. Rotherham & Co., 38, Bailey Lane, Coventry.

House & Son, Ltd.—Private company. Registered December 22nd. Capital, £6,000. Objects: To carry on the business of electricians, electrical, mechanical, radio, civil and constructional engineers, &c. The permanent directors are: A. W. House and Mrs. F. J. House, both of Stamford House, 2, West Bank Terrace, Acomb Road, York, and W. S. House, 13, Malton Way, Rawcliffe Lane, Clifton, York. Registered office: Electricity House, Blake Street, York.

Yorath-Lewis Boilers, Ltd.—Private company. Registered December 22nd. Capital, £100. Objects: To acquire and exploit inventions relating to heat production, transfer and conversion apparatus used in connection with water tube boilers, and steam turbines or engines, &c., and to adopt an agreement with W. Y. Lewis for the acquisition of his British and foreign water tube boiler patent rights. The subscribers are: W. Y. Lewis, 17, Woronzow Road, St. John's Wood, N.W.8, and W. H. Fox, 65, Redcliffe Gardens, S.W.10. W. Y. Lewis is a permanent director.

Alfred Rose & Co., Ltd.—Private company. Registered December 22nd. Capital, £100. Objects: To carry on the business of designers, manufacturers, repairers, exporters and importers of, agents for and dealers in radio and electrical apparatus and accessories, &c. The subscribers are: J. H. Wates, Rocklands, Lydney, Glos., and G. Bown, Penwalden, Tutshill, Chepstow, Mon. Secretary: G. Bown.

Near East Neon Co., Ltd.—Private company. Registered December 22nd. Capital, £2,000. Objects: To carry on the business of manufacturers of advertising and display signs and lighting arrangements of all kinds, by means of neon or other lighting or other methods, &c. The subscribers are: L. G. Owen, 5, St. Amir Hussun, Zamalik, Cairo, and G. Sims Marshall, 28, Sharia El. Maghraby, Cairo. Secretary: L. G. Owen. Solicitors: Geo. S. Marshall, 28, Sharia El. Maghraby, Cairo.

Wentworth & Treacher, Ltd.—Private company. Registered December 23rd. Capital, £1,400. Objects: To carry on the business of ironmongers, hardware dealers, electricians, dealers in electrical apparatus, &c. The directors are: J. J. Treacher (permanent), 14, Stansfield Road, S.W.9, and two others. Registered office: 15, Hand Court, High Holborn, W.C.1.

Parker Roberts, Ltd.—Private company. Registered December 23rd. Capital, £100. Objects: To carry on the business of buyers, sellers, manufacturers, importers and exporters of and dealers in radio, television, gramophones, gramophone records, musical instruments, electrical appliances, &c. The directors are: W. M. Parker, 205, Hall Lane, Chingford, E.4, and two others. Registered office: 136, Cherrydown Avenue, Chingford, E.4.

Bournemouth Air Purifiers, Ltd.—Private company. Registered December 23rd. Capital, £500. Objects: To acquire an agency for the sale and distribution of air-cleaners, and to carry on the business of manufacturers and distributors of air cleaners or other similar machines or distributors or agents for the sale of electrical equipment, &c. The directors are: J. W. Ewen, 11, Court Road, Bournemouth, and two others. Secretary: F. W. Ward. Registered office: 15, Post Office Road, Bournemouth.

Architectural Constructional & Electrical Utilities, Ltd.—Private company. Registered December 23rd. Nominal capital, £15,000. Objects: To acquire from P. K. Morgan an exclusive licence to make, use, exercise and vend a light reflector device known as a "collecting ring," and to carry on the business of manufacturers of and dealers in lighting devices, accessories and apparatus, electric batteries, switches and other lighting accessories, cinematograph apparatus and accessories, refrigerating apparatus, &c. The subscribers are: F. E. Farres and G. H. Woodcock, both of 2, Bond Court, Walbrook, E.C.4. B. Laing is the first and permanent director and may appoint other directors. Solicitors: Linklaters & Paines, 2, Bond Court, Walbrook, E.C.4.

Wolverhampton Die-Casting Co., Ltd.—Private company. Registered December 16th. Capital, £100 in 400 ordinary shares of 5s. each. Objects: To acquire the undertaking and assets of the Wolverhampton Die-Casting Co., Ltd. (in voluntary liquidation) and to carry on the business of die-casters, makers and sinkers; electrical, wireless, mechanical, general engineers, &c. The subscribers are: Alfred McLees, 228, Kenton Lane, Harrow, certified accountant, and Helen J. Pummery, 161, Waverley Avenue, Whitton, Middlesex, secretary. Solicitors: Clifford-Turner & Co., 11, Old Jewry, E.C.2; and Fowler Langley & Wright, Wolverhampton. Registered office: Graiseley Hill Works, Graiseley Hill, Wolverhampton.

Dee-Ree Factors, Ltd.—Private company. Registered December 15th. Capital, £500. Objects: To carry on business as factors of electric lighting, heating and power accessories, motors and engineering equipment, &c. The directors are: C. P. Dawes, "The Olives," Clevedon Road, Newport, Mon; and C. Poole, "Finsbury," Caeran Road, Newport, Mon. Registered office: 4, Friars Street, Newport, Mon.

Radio Service (Bournemouth), Ltd.—Private company. Registered December 17th. Capital, £100. Objects: To acquire the business of a radio dealer and electrical engineer carried on by J. N. Dayer at 230, Old Christchurch Road, Bournemouth. The directors are: J. N. Dayer and M. O. M. Dayer, both of 3, William Road, Bournemouth. Registered office: 230, Old Christchurch Road, Bournemouth.

Linkafone, Ltd.—Private company. Registered December 18th. Capital, £100. Objects: To carry on business as telephone, radio and television instrument makers, &c. The subscribers are: H. Dodgson, Co-operative Buildings, Flockton, near Huddersfield; and R. Silver, 67, School Street, Moldgreen, Huddersfield. Secretary: E. Gee. Registered office: 6, Queen Street, Huddersfield.

J. B. F. Wallen, Ltd.—Private company. Registered December 10th. Capital, £100. Objects: To carry on the business of radio and electrical engineers, manufacturers of and agents for dealers in electrical goods, motor and general engineers, &c. The subscribers are: A. C. Saunders, 4, York House, Carlisle Street, S.E.1, and F. J. Hammond, 108, Hungerford Road, Holloway, N.7. Solicitors: Canter, Hellyar & Co., 3-4, Lincoln's Inn Fields, W.C.2.

Dougherty & Janitch, Ltd.—Private company. Registered December 9th. Capital, £100. Objects: To carry on the business of manufacturers of and dealers in electrical, gas, oil and quartz lamps, reflectors, electrical and mechanical recording instruments, bells, fires, stoves, cookers, switchboards, control gear, fans, &c. The directors are: C. Wallis, 9, Grove House, The Grove, Epsom; and Mrs. G. P. Janitch, 15, Ledway Drive, Wembley. Registered office: 68, Victoria Street, S.W.1.

Day's Radio, Ltd.—Private company. Registered November 20th. Capital, £100. Objects: To carry on the business of electrical engineers and contractors, radio and television engineers, &c. S. J. Jay, 31, Teignmouth Road, N.W.2, is first director. Solicitor: C. W. Jarvis, 79, Mark Lane, E.C.3.

Returns of Electrical Companies

Sheerness & District Electric Supply Co., Ltd.—The nominal capital has been increased by the addition of £25,000 in £1 ordinary shares beyond the registered capital of £75,000. The B.E.T. Electricity Supply Co., Ltd., holds practically all the issued shares.

E.M.F. (Electrical), Ltd.—Capital, £5,000 in £1 shares. Return dated December 7th, 1937. All shares taken up. £5,000 paid. Mortgages and charges nil.

British Home & Office Telephone Co., Ltd.—Capital, £10,000 in £1 shares. Return dated October 6th, 1937. 5,230 shares taken up. £5,230 paid. Mortgages and charges nil.

Automobile & Home Radio, Ltd.—Capital, £100 in £1 shares. Return dated November 23rd, 1937. Five shares taken up. £5 paid. Mortgages and charges: £1,500.

Auto Service Electrical Company (Falmouth), Ltd.—Capital, £3,000 in £1 shares. Return dated September 22nd, 1937. All shares taken up. £1,620 paid. £1,380 considered as paid. Mortgages and charges nil.

Electric Driers, Ltd.—Capital, £2,000 in £1 shares. Return dated October 13th, 1937. All shares taken up. £1,950 paid. £50 considered as paid. Mortgages and charges nil.

Stella Conduit Co., Ltd.—Capital, £20,000 in £1 shares. Return dated November 8th, 1937. All shares taken up. £20,000 considered as paid. Mortgages and charges, nil.

Magna Wire & Cable Co., Ltd.—Capital, £11,000 in 10,000 preference shares of £1 and 20,000 ordinary shares of 1s. Return dated November 19th, 1937. 2,027 preference and 11,500 ordinary shares taken up. £2,027 paid. £545 considered as paid. Mortgages and charges, nil.

Philips Lamps, Ltd.—Capital, £100,100 in 100,000 shares of £1 and 100 "B" shares of £1. Return dated October 22nd, 1937. All shares taken up. £100,100 paid. Mortgages and charges, nil.

Willet & Robinson, Ltd.—Capital, £7,000 in 3,000 "A" cumulative preference, 1,000 "B" preference and 3,000 ordinary shares of £1. Return dated November 19th, 1937. 3,000 "A" preference and 3,000 ordinary shares taken up. £6,000 paid. Mortgages and charges, £8,390.

Wilkinson, Bentley & Co., Ltd.—Capital, £3,000 in £1 shares. Return dated November 17th, 1937. 1,850 shares taken up. £1,850 paid. Mortgages and charges, nil.

Alger's Wholesale Supplies, Ltd.—Charge on 45, Dock Street, Newport, Mon, dated December 8th, 1937, to secure all moneys due or to become due from the company to Lloyds Bank, Ltd., not exceeding £3,000.

Wilkinsons (London), Ltd.—Charge on properties in Bethnal Green, E., dated December 6th, 1937, to secure £4,000. Holders: Mrs. D. M. Howe, "Mornonih," Priests Lane, Shenfield; and Miss M. B. Bradridge, "High Barton," Hall Wood Crescent, Shenfield.

E. Leaverland, Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated November 15th, 1937, to secure £200. Holders: Vigor Finance Company, Ltd., Samson House, Huddersfield Road, Brighouse.

Bungay Gas and Electricity Co., Ltd.—Satisfaction in full on November 19th, 1937, of second debentures authorised November 13th, 1929, and registered November 22nd, 1929, securing £2,450.

Bath Electric Tramways, Ltd.—Satisfaction in full on November 30th, 1937, of trust deed dated December 6th, 1904, and supplemental trust deed dated December 28th, 1905, and registered December 13th, 1904, and January 11th, 1906, respectively, securing £142,000 debenture stock.

X-Rays, Ltd. (old company).—Sir W. Lacon Threlford, of 28a, Basinghall Street, E.C., ceased to act as receiver and/or manager on December 9th, 1937.

Simplex Electric Switchgear, Ltd.—Capital, £100 in £1 shares. Return dated November 8th, 1937. All shares taken up. £100 paid. Mortgages and charges, nil.

Anchor Insulating Co., Ltd.—Capital, £6,000 in £1 shares. Return dated October 6th, 1937. 5,277 shares taken up. £837 paid. £4,440 considered as paid. Mortgages and charges, nil.

Vincent Switchgear Manufacturing Co., Ltd.—Capital, £10,000 in £1 shares. Return dated September 30th, 1937. 7,948 shares taken up. £7,948 considered as paid. Mortgages and charges, £3,000.

Watsham's, Ltd.—Capital, £25,000 in £1 shares. Return dated August 23rd (filed November 15th), 1937. 15,490 shares taken up. £2,911 paid. £12,579 considered as paid. Mortgages and charges, nil.

E. C. Stokes, Ltd.—Capital, £1,000 in £1 shares. Return dated November 5th, 1937. 502 shares taken up. £2 paid. £500 considered as paid. Mortgages and charges, £500.

Morton Industries, Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated November 10th, 1937, to secure £350. Holder: Mrs. G. N. Samson, 86, Highland Heath, Putney, S.W.

Johnson & Company (Bradford), Ltd.—Capital, £1,000 in 500 preference and 500 ordinary shares of £1. Return dated August 11th (filed October 23th), 1937. 500 ordinary shares taken up. £500 paid. Mortgages and charges, nil.

London General Supply Co., Ltd.—Mortgage on 94 agreements for hire of goods (vacuum cleaners), and full benefit thereof, and all moneys payable thereunder, &c., dated November 30th, 1937, to secure £499. Holders: Bylock Electric, Ltd., 109, South Street, Ponders End.

City Notes

The Philco Radio and Television Corporation of Great Britain, Ltd., announces that the dividend on the 6 per cent. preference shares due on January 1st will not be paid. The directors state that a loss has been incurred as a result of the unprecedented bad season and that large stocks have had to be disposed of at greatly reduced prices. Economies are believed to have been effected in several directions which will enable the company to meet the changed conditions in the radio market.

The Montreal Light, Heat & Power Consolidated is paying a quarterly dividend of $0.38 on the common shares (unchanged).

Newman & Watson, Ltd., have decided to defer payment on the 6 per cent. cumulative preference shares until the end of the financial year.

Moffats, Ltd., have increased their capital to £50,000. All the shares have been issued and paid up.

Marconi's Wireless Telegraph Co., Ltd., is paying a final dividend of 3½ per cent. on the 7 per cent. preference shares.

Stocks and Shares

TUESDAY EVENING.

THE financial review of the year 1937 is not one which will arouse any particular satisfaction, much less enthusiasm in the mind of the average investor. He has seen the values of his stocks and shares depreciated by a variety of circumstances over which he has had literally no control. The first three months of the year passed pleasantly enough. Stock Exchange business was good; prices were well maintained; the atmosphere held an optimistic air. Mr. Neville Chamberlain, then Chancellor of the Exchequer, flung the first apple of discord when he introduced his ill-conceived N.D.C. proposals into the Budget. Their subsequent modification failed to restore the optimism that had been current previously. Following upon this, one thing after another occurred, mainly abroad, to disturb business in Stock Exchange markets.

National trade has remained good throughout the period, but a cautious complex spread amongst large sections of the investing public. Stock Exchange brokers have been constantly warned by their clients that the country has attained the peak of its prosperity, and that, notwithstanding official assurances to the contrary, we may now expect to see a recession in the main arteries of trade.

The best prices of the year were, in a good many cases, those reached during the first few weeks. The lowest prices were touched about November 22nd, when heavy sales of stock, forced out under the influence of liquidation, were thrown upon markets for what prices could be obtained. Within the past six weeks material rallies have taken place. Throughout the period the value of Home electricity supply shares has depreciated in sympathy with gilt-edged securities. Provincial companies' shares have taken their cue from the London list, as this table shows:—

Ordinary Shares.	Dec. 31 1935.	Dec. 29 1936.	Now.	Fall.
Bournemouth & Poole	77/6	77/6	67/6	10/–
Clyde Valley	44/6	45/6	40/–	5/6
Elec. Dis. Yorkshire	46/–	45/–	41/6	3/6
Lancs. Light & Power	38/–	38/–	33/–	5/–
Midland Counties	39/–	39/6	37/6	2/–
Midland Elec. Power	41/3	41/3	41/3	—
North Eastern	34/–	32/6	32/–	6d.
Northampton	51/3	51/3	45/–	6/3
Scottish Power	42/6	41/–	37/–	4/–
Yorkshire Elec.	45/–	44/6	39/6	5/–

Of the London supply companies, London Associated shares have fallen from 35s. to 31s. 3d.; Metropolitans, at 45s., and County of Londons, at 49s., are each about 5s. down.

Electricity Supply Cross-currents

The events of the year in this market have been, of course, the appearance of schemes for reorganisation of the industry. Satisfaction over the McGowan Committee's recommendations gave place to militant discontent with the Government's bureaucratic interpretation of their intention. This was succeeded in turn by the calm view that legislation, when it comes, will probably be shaped on the McGowan model, rather than on that of the Government proposals. Prices have been swayed one way and another by these considerations, besides being influenced, as already noted, by trends in the gilt-edged market.

Gilt-edged Stocks

The year opened with gilt-edged stocks on the down grade: the slant continued until yields on long term investments were on a 3½ per cent. basis. This adjustment completed, prices became steady and gathered increasing firmness throughout the last quarter of the year. Fixed-interest stocks have benefited, as a class, from the wavering of confidence in industrial and commodity share markets. Money has become more interested in security and reliability of income than in the more speculative attractions of other fields of investment. Despite the recent strength of prices, gilt-edged stocks show, on balance, fairly substantial reductions. Central Electricity "fives," of 1950-70, are down from 120 to 113, and the 4½ per cents. of 1951-73 from 113 to 109. London Transport stocks have fared similarly, except of course, in the case of the "C" stock.

which finishes an eventful year with a loss of 18 points, at 80. Industrial debentures and preference shares of sound character have followed the lead of the gilt-edged market.

Manufacturing and Equipment

Higher dividends and falling share prices have been the mixed lot of the holder of industrial ordinary shares. In the electrical equipment market the dividend on General Electrics has been raised from 15 to 17½ per cent.; and on Associated Electricals, from 8 to 10 per cent. Electric Constructions paid 10, against 7 per cent., and Siemens 7½ against 6 per cent. These and other practical signs of continued industrial prosperity have failed to protect prices of many shares from falls. Representative examples are as follows:—

Ordinary Shares.	Dec. 31, 1935.	Dec. 28, 1936.	Now.	Rise or Fall.
Babcock & Wilcox	52/–	2½	43/3	– 6/9
British Aluminium	43/9	44/–	46/3	+ 2/3
British Insulated	5	6⅛	4⅛	– 1½
Callender's	3⅞	4⅝	4 7/16	– 1/16
Enfield Cables	5½	5 5/16	5⅛	– 1/16
G.E.C.	73/–	94/6	77/–	–17/6
Johnson & Phillips	48/9	49/6	41/3	– 8/3
Siemens	26/3	35/–	28/9	– 6/3

Among the brighter spots are Telegraph Constructions, which have returned to the dividend list, after a six-year lapse, with a payment of 7½ per cent.; the quotation, at 2 5/16, compares with 33s. 9d. a year ago. Lancashire Dynamos at 3⅜ are scarcely changed, despite the doubling of the 10 per cent. dividend. English Electrics, now 30s., are 1s. up on a year which has seen the extinction of the company's preference dividend arrears and the opening of the way to ordinary dividends. In the above table, no account has been taken of "rights" which may have accrued through bonus issues, &c. British Insulated, for instance, has distributed a free one-in-five share bonus. The General Electric Company made an issue on bonus terms. Henley's divided the £1 share into four new shares of 5s. each, and distributed an equal number of the latter.

Telegraphs and Telephones

During the year, the old Cable and Wireless "A" and "B" ordinary stocks disappeared under the capital reconstruction of the company, and reappeared, much written-down, as a single ordinary stock. The latter is quoted now at 66½, against this year's high point of 86½. For each £100 of the old issues, the "A" stock received £30, and the "B" stock £7½ of the new. A year ago, the respective prices were 20½ and 6½. Arrears of preference dividends were funded in a 4 per cent. income stock, at present quoted at 101½. Holders of the preference felt that their stock had emerged well from the melting-pot. The monthly cable traffic indices had a flying start over the 1936 figures, but failed to keep up the pace. A few comparisons are given of the rise or fall on the year:—

Stock or Share.	Dec. 31, 1935.	Dec. 29, 1936.	Now.	Rise or Fall.
American Tel. & Tel.	155	187½	146½	–41
Anglo-American pref.	124½	129½	115½	–14
Cable & Wireless pref.	106	101	102½	+ 1½
Globe Ordinary	15½	14	15½	+ 1½
Great Northern	40	46½	40	– 6½
International Tel. & Tel.	13	12½	7½	– 4¾
Marconi Marine	36/3	37/6	28/9	–8/9

Improvement in Globe ordinary corresponds with the better outlook for Cable and Wireless. The fall in Marconi-Marines is disappointing, in view of the revival in shipping activity. Conditions in America are reflected in the collapse of American "Tel. and Tel." This year's fall has more than wiped out the gain of 32 points shown at the end of last year.

Foreign Affairs

Alarms and uncertainties in the international sphere must take chief responsibility for the year's depreciation in stocks and shares. Events in Europe, America and the Far East have stood in the way of recovery from the avalanche started by the collapse of the gold and commodity booms. European politics have, it need scarcely be repeated, kept markets on tenterhooks for long stretches at a time. In America, the calamitous result of the Administration's anxiety to avoid the evils of a boom has not only cut in half the price of many Wall Street stocks, but has embroiled Home markets in further bouts of forced selling: a deeper effect of the same cause is the fear of danger to world trade arising from the sharp setback in United States business activity. American utility and railroad stocks have suffered with the rest from Mr. Roosevelt's social experiments. War in the Far East has tightened the strain on general confidence, and more particularly, has weakened the security of local investments: Tokyo Electric 6 per cent. bonds, for instance, have dropped from 80 to 60. Disturbances in Palestine find typical reflection in the price of Palestine Electric "A" shares, now standing at 30s., which have dropped about 16s. Dictatorship in Brazil is the latest snag for the investor overseas. Fears of nationalistic interference with private enterprise leave the price of Brazilian Tractions at 12¾, after its having crossed 30 at one time, as compared with 18½ at the beginning of the year. The fall has happened despite the company's payment of unexpectedly good dividends. Altogether, the year's international developments have been far from helpful to the holders of shares in enterprises at home or overseas. The new year finds prices at levels sufficiently modest to permit justifiable improvement as soon as—to quote the Stock Exchange aphorism—"things settle down."

Share List of Electrical Companies

Home Electricity Companies.

	Dividend. Nom. Previous.	Dividend. Last.	Price Dec. 28.	Rise or Fall.	Yield p.c. £ s. d.
Bournemouth and Poole	1	15	15	67/6	—	4 9 0
City of London	1	7½	7½	34/–	—	4 8 3
Clyde Valley	1	7	8	2	—	4 0 0
County of London	1	10½	10½	49/–	—	4 5 9
Edmundson's 7% Pref.	1	7	7	33/–	—	4 4 10
Do. Ord.	1	8	9	38/–	—	4 14 9
Elec. Dis. Yorkshire	1	9	9	41/6	—	4 6 10
Elec. Fin. and Securities	1	12½	12½	2⅝	—	4 15 3
Elec. Supply Corporation ...	1	11	12	52/–	—	4 12 5
Lancs Light and Power	1	7½	7½	33/–	—	4 11 0
Lond. Assoc. Electric	1	—	7	31/3	—	4 9 6
London Electric	1	7	8	35/6	—	4 10 2
London Power Deb. Red. ...	Stock	5	5	106½	—	4 14 0
Metropolitan	1	10	10	45/–	—	4 9 0
Midland Counties	1	7½	8	37/6	—	4 5 0
Mid. Elec. Power	1	8	9	2 1/16	—	4 7 4
North Eastern Electric Ordinary	1	6	7	32/–	—	4 7 6
Do. 7% Pref.	1	7	7	34/–	—	4 2 4
Northampton	1	10	10	45/–	—	4 9 2
Notting Hill 6% Pref.	10	6	6	14	—	4 5 9
North Met. Elec. Ordinary ...	1	10	10	47/6	—	4 4 2
Do. do. 6% Pref. ...	1	6	6	30/–	—	4 0 0
Scottish Power	1	8	8	37/–	—	4 6 6
South London	1	7	7	32/6	—	4 6 2
Whitehall Elec. Invst 7½% Pref.	1	7½	7½	21/6	—	6 19 6
Yorkshire Elec.	1	8	8	39/6	—	4 1 0

Public Boards.

Central Electricity, 1950–70 ...	Stock	5	5	113	—	4 8 6
Do. 1955–75 ...	,,	5	5	116	—	4 6 2
Do. 1951–73 ...	,,	4½	4½	109	—	4 2 7
Do. 1963–93 ...	,,	—	3½	98	—	3 11 5
London Elec. Trans. Gtd. ...	,,	—	2½	91	—	2 15 0
London & Home Counties, 1955–75	,,	4½	4½	112	—	4 0 4
London Passenger Transport, A...	,,	—	4½	117½	—	3 16 9
Do. do. B...	,,	—	5	120½	—	4 3 0
Do. do. C...	,,	4	4½	80	—	5 6 3
West Midlands Joint Elec. 1948–68	,,	—	5	112	—	4 9 3

Telegraph and Telephone.

American Tel. & Tel.	$160	9	9	146½	—	6 2 10
Anglo-Am. Tel. Pref.	Stock	6	6	115½	—	5 4 0
Do. Def.	,,	1½	1½	28½	—	5 5 3
Cable & Wireless 5½% Pref. ...	,,	4½	5½	102½	—	5 7 5
Do. Ord.	,,	—	—	66½	—	—
Do. Income	,,	—	—	101½	—	3 18 10
Globe Tel. & Tel. Ord.	10	4½*	5½*	15½	—	3 13 4
Do. do. Pref.	10	6	6	13⅞	—	4 6 6
Great Northern Tel.	10	20	20	40	—	5 0 0
Marconi-Marine	1	10	7½	28/9	—	5 4 4
Oriental Telephone Ord.	1	12*	12*	2⅞	—	4 3 6

Home and Foreign Trams, etc.

Anglo-Arg. Trams First Pref. ...	5	Nil	Nil	7/6	+⅛	—
Do. do. 2nd Pref.	5	Nil	Nil	4/6	+9d.	—
Do. do. 5% Deb.	Stock	Nil	Nil	25½	+1	—
British Electric Traction Def. Ord.	,,	5	5	1040	—	—
Do. do. Pref. Ord.	,,	8	8	165	—	4 17 0
Brazil Traction	$100	70 cts.	$1	12⅝	–1½	7 16 10
Brit. Columbia Elec. Rly. Pce. ...	Stock	5	5	105½	—	4 14 9
Mexican Light Common	$100	Nil	Nil	2	—	—
Do. 1st Bonds	$500	5	5	35	—	—
Victoria Falls Ord.	1	20	12	3 1/16	—	4 0 0
West Riding	1	6½	10	2	—	5 0 0

Manufacturing Companies.

Aron Electricity Ord.	1	15	15	2	—	7 10 0
Assoc. Elec. Ord.	1	8	10	44/6	—6d.	4 10 0
Do. Pref.	1	8	8	38/–xd.	—	4 4 6
Babcock & Wilcox	1	8	10	43/3	—	4 12 6
British Aluminium Ord.	1	7½	10	46/3	—	4 6 0
British Insulated Ord.	Stock	20	20	4⅛	—	4 6 6
Brush Ord.	Stock	Nil	Nil	27	—	—
Callender's	1	15	15	4 7/16	—	3 9 1
Do. 6½% Pref.	1	6½	6½	31/3	—	4 2 4
Crompton Parkinson Ord. ...	5/–	12½	12½	2½	—	—
Do. 8% Pref.	1	8	8	37/6	—	4 5 4
Electric Construction	1	7	10	1 13/16	—	5 10 4
Enfield Cable Ord.	1	25	25	5⅛	—	4 17 8
English Electric	1	Nil	Nil	30/–	+6d.	—
Do. do. Pref.	1	6½	6½	25/6	—	5 2 0
Ericsson Tel.	5/–	20	25	2⅛	—	2 18 10
Ever Ready	5/–	35	45	26/–	—	8 13 2
Ferranti Pref.	1	7	7	27/6	—	5 1 10
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	15	17½	77/–	–6d.	4 11 0
Henley's	5/–	30	15	19/6	—	3 16 10
Do. 4½% Pref.	1	4½	4½	1⅛	—	4 0 0
India-Rubber Pref.	1	5½	5½	21/3	—	5 3 6
Johnson & Phillips	1	½	10	41/3	—	4 17 0
Lancashire Dynamo	1	10	20	3⅜	–½	5 18 4
Siemens Ord.	1	6	7½	28/9	—	5 4 4
Telegraph Construction	£1	Nil	7½	2 1/16	—	3 5 0

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1936

5861. "Electric cables, or other insulated electric conductors and the manufacture thereof." Soc. Alsacienne de Constructions Mecaniques. February 27th, 1935. (476040.)

11944. "Control mechanisms for electric motors." Chicago Flexible Shaft Co. June 3rd, 1935. (475963.)

12119. "Inductance coils." H. W. Cox. April 29th, 1936. (475964.)

15022/3. "Electrical calculating machines." Electrical Improvements, Ltd., and C. L. Blackburn. May 27th, 1936. (476164/5.)

15096. "Electric systems for the automatic control of variable conductor." Taylor Instrument Co. May 29th, 1935. (476108.)

15126. "Insulating sleeves." Felten & Guilleaume Carlswerk Akt.-Ges. May 28th, 1935. (476110.)

15228. "Semi-automatic telephone exchange systems." Standard Telephones & Cables, Ltd., E. P. G. Wright and G. C. Hartley. May 29th, 1936. (476048.)

15302. "Insulators for high-tension electric lines." Compagnie Générale d'Electro Ceramique. May 31st, 1935. (Cognate application 15303/36.) (476295.)

15404. "Systems of electric motor control." British Thomson-Houston Company, Ltd., and G. Ovens. June 2nd, 1936. (476174.)

15451. "Electrical relays." A. Cianchi. June 2nd, 1936. (476176.)

15478. "Means for recording calls upon an automatic telephone." C. V. L. Mitchell. June 4th, 1935. (476301.)

15498. "Device for the testing of the electrical circuit of a power-driven vehicle." R. G. Tull. June 3rd, 1936. (476303.)

15579. "Call meters for telephone systems." Sodeco Soc. des Compteurs de Geneve. June 8th, 1935. (476232.)

15580. "Electron-discharge devices." Baird Television, Ltd., and D. M. Johnstone. June 4th, 1936. (476233.)

15600. "Aerial systems for wireless reception and transmission." Gramophone Co., Ltd., and L. A. Chapman. June 4th, 1936. (Addition to 444494.) (476235.)

15605. "Dynamo-electric machines." R. Bosch Akt.-Ges. June 29th, 1935. (476236.)

15620. "Cathode-ray tubes." R. Koempfner. June 4th, 1936. (Cognate applications 20756/36 and 22732/36.) (476311.)

15631. "Electron-discharge devices." W. E. Williams. June 4th, 1936. (476237.)

15638. "Thermionic amplifiers." Rediffusion, Ltd., and P. Adorjan. June 4th, 1936. (476179.)

15655. "Speed regulators for electric motors." R. G. Griffith. June 4th, 1936. (475968.)

15659. "Electric-discharge lamps." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Glühlampen.) June 4th, 1936. (476240.)

15817. "Dry-contact metal-rectifiers." Standard Telephones & Cables, Ltd., and L. J. Ellison. June 5th, 1936. (476250.)

15872. "Electrical circuits for high frequency currents." Baird Television, Ltd., and D. W. Pugh. June 6th, 1936. (476256.)

15904. "Band resistances for the continuous regulation of heavy currents." Akt.-Ges. Brown, Boveri & Cie. July 25th, 1935. (Addition to 467574.) (476055.)

15928. "Electric accumulators." Batteries, Ltd., and M. Dybeck. June 8th, 1936. (476056.)

15998. "Iron alloys suitable for electrical resistances." United Steel Companies, Ltd., and T. Swinden. June 8th, 1936. (476115.)

16002. "Electric-discharge devices." British Thomson-Houston Company, Ltd., and W. J. Scott. June 8th, 1936. (476260.)

16091. "Scanning-discs for television transmitters." D. S. Loewe Radioakt.-Ges. June 11th, 1935. (Cognate application 16092/36.) (476181.)

16111. "Light valves, particularly for television receiving apparatus." M. J. Goddard and I. M. K. Syndicate, Ltd. June 9th, 1936. (475971.)

16794. "Electric battery lamps." S. Wiseman. June 16th, 1936. (476185.)

16887. "Stranded members formed of wire or metal strip particularly applicable to electric conductors." Callender's Cable & Construction Co., Ltd., P. V. Hunter and H. Hill. June 17th, 1936. (475973.)

17144. "Thermionic power valves." J. H. Ludlow and Metropolitan-Vickers Electrical Co., Ltd. June 19th, 1936. (476187.)

17150. "High-frequency vacuum electric tubes and circuits thereof." J. H. Ludlow and Metropolitan-Vickers Electrical Co., Ltd. June 17th, 1936. (476188.)

17248. "Electrically operated hand tools." H. A. Whiteside. June 20th, 1936. (475974.)

17870. "Circuit arrangements for quenching arcs in electric-discharge vessels." W. O. Schumann. April 23rd, 1936. (476120.)

19252. "Start-stop telegraph apparatus." R. G. Griffith. July 11th, 1936. (476123.)

19380. "Mercury-vapour electric-discharge lamps." Siemens Electric Lamps & Supplies, Ltd., and J. N. Aldington. July 13th, 1936. (476190.)

20177. "Electric-discharge devices." General Electric Company, Ltd. (Patent-Treuhand-Ges. für Elektrische Glühlampen.) July 21st, 1936. (476066.)

20306. "Valve amplifiers." General Electric Co., Ltd., and D. C. Espley. July 22nd, 1936. (Cognate application 15891/37.) (476067.)

20781. "Terminal boxes for electrical heating devices for cooking stoves." C. Sykes, W. Needham and Metropolitan-Vickers Electrical Co., Ltd. July 27th, 1936. (476192.)

20996. "Impulse-transmitters for automatic telephone systems." General Electric Co., Ltd., and J. E. Collyer. July 29th, 1936. (476127.)

22118. "Audio-frequency amplifiers such as those of wireless receiving sets." P. K. Turner and Hartley Turner Radio, Ltd. August 11th, 1936. (476069.)

23330. "Electric-discharge devices." General Electric Co., Ltd. (Patent-Treuhand Ges. für Elektrische Glühlampen.) August 25th, 1936. (476132.)

24788. "Electrical instruments of the relay type." H. Butler, Ltd., and R. H. Jupp. September 11th, 1936. (Cognate application 33908/36.) (476071.)

27194. "Maximum-demand electric supply meters." Landis & Gyr Akt.-Ges. October 29th, 1935. (475985.)

29476. "Insulated electric conductors." Siemens-Schuckertwerke Akt.-Ges. October 29th, 1935. (476075.)

31852. "Device for the replacement of a light source from a distance." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. November 22nd, 1935. (476138.)

31936. "Communication systems." International Business Machines Corpn. December 14th, 1935. (476273.)

35249. "Separators for electric accumulators or other galvanic cells." Chloride Electrical Storage Co., Ltd. (Accumulators Fabrik Akt.-Ges.). December 23rd, 1936. (476207.)

35369. "Disintegration by means of an electric-glow discharge." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. December 28th, 1935. (476208.)

35862. "Picture-transmitting devices for television purposes." Zeiss Ikon Akt.-Ges. March 24th, 1936. (475995.)

1937

941. "Thermally controlled circuit-breakers." Leland Electric Co. February 13th, 1936. (476276.)

2879. "Method of producing freely wound coils for electrical measuring instruments." Hartmann & Braun Akt.-Ges. June 2nd, 1936. (476086.)

3185. "Devices for effecting image analysis applicable to television." R. G. Wilson and W. D. Silver. February 3rd, 1937. (475999.)

3815. "Dials for radio apparatus." Ideal Werke Akt. Ges. für Drahtlose Telephonie. March 16th, 1936. (476087.)

4295. "Digit registering and transmission equipment such as used in telephone systems." Standard Telephones & Cables, Ltd., M. S. Snell and E. P. G. Wright. February 12th, 1937. (476088.)

4680. "Electric-discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. February 19th, 1936. (476090.)

5030. "Radio beacon system." Standard Telephones & Cables, Ltd. April 10th, 1936. (476215.)

6476. "Power-lines for wireless antennæ." C. Lorenz Akt.-Ges. March 4th, 1936. (Addition to 408323.) (476279.)

7192. "Electron-discharge devices." Telefunken Ges. für Drahtlose Telegraphie. March 13th, 1936. (476144.)

9043. "Apparatus for obtaining the appearance of handwriting or the like, by means of electric-discharge luminous-tubes and like devices." Soc. Cooperative Neolumen. March 31st, 1936. (476094.)

9299. "Thermionic valve circuits." Standard Telephones & Cables, Ltd. April 1st, 1936. (476013.)

9665. "Very-high-frequency electron-discharge device oscillator arrangements utilising secondary emissive effects." Marconi's Wireless Telegraph Co., Ltd. April 30th, 1936. (476020.)

10208. "Radio receivers and the like." Telefunken Ges. für Drahtlose Telegraphie. April 9th, 1936. (476218.)

10635. "Signalling systems for distributing speech or other sounds to listeners." Guided Radio Corpn. April 29th, 1936. (476022.)

10790. "Polarisation filters." Zeiss Ikon Akt.-Ges. April 25th, 1936. (476023.)

10913. "Electrical cables." Standard Telephones & Cables, Ltd. September 11th, 1936. (476098.)

11127. "High-frequency transmission systems." Standard Telephones & Cables, Ltd. May 19th, 1936. (476024.)

17102. "Electric irons." J. H. Collins, E. F. Beech, and H. Wall, Ltd. June 19th, 1937. (476287.)

17609. "Electric condensers." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. June 27th, 1936. (476155.)

17763. "Direct-reading radiogoniometers." M. Parisier and Soc. des Etablissments Henry-Lepaute. June 26th, 1936. (476289.)

29386. "Control mechanisms for electric motors." Chicago Flexible Shaft Co. June 3rd, 1935. (Divided out of 475963.) (476159.)

32240. "Electric interrupting devices." Electrical Improvements, Ltd., and C. L. Blackburn. May 27th, 1936. (Divided out of 476164.) (476224.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from December 22nd.

Spartovac. No. 578425. All goods in Class 6.—Electrical Commodities, Ltd., Duke Street House, 415-417, Oxford Street, W.1.

Yorcoron. No. 579864. All goods in Class 6.—The Yorkshire Copper Works, Ltd., Pontefract Road, Stourton, Leeds.

Forograph. No. 580086. Class 8. Apparatus for the production of facsimile matter on duplicating stencils by the transmission of light rays.—Koreska (Gt. Britain), Ltd., West Road, Northumberland Park, Tottenham, N.17.

Bell (lettering and design). No. 572271. Class 13. Electric lighting fittings and electric lamps (ordinary).—British Electric Lamps, Ltd., Spencer Lamp Works, Spencer Hill Road, Wimbledon, S.W.19.

Ajand. No. 581256. Class 13. Electric lighting and heating fittings of ordinary metal.—Albert J. H. Andrew, trading as A. J. Andrew, Gamage Building, Holborn, E.C.1.

P. & B. (lettering and design). No. 574741. Class 50. Electrical insulating tapes made of fabric impregnated with bituminous compositions, &c.—The Ruberoid Co., Ltd., Lincoln House, 296-302, High Holborn, W.C.1.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdare.—Houses (108), Llwydcoed; U.D.C. surveyor.

Ampthill.—Nurses' home, Steppingley Isolation Hospital; L. Foster, R.D.C. surveyor, Council Offices, Flitwick.

Ayr.—Ice rink, Beresford Park; A. F. M. Mathie Morton, solicitor, Ayr.

Barnsley.—School of Art (£4,900), and extensions to Girls' High School (£10,895), for the E.C.

Berkshire.—School, Woodley, near Reading, for the E.C.; W. F. Herbert, education secretary, Shire Hall, Reading.

Berwickshire.—School, Chirnside (£28,820), for the C.C.; county clerk, Duns.

Billinge.—Houses (32), Birchley site; A. Dorlington, U.D.C. surveyor, Council Offices.

Birmingham.—Block of showrooms, and garages, Broad Street, for George Heath, Ltd., John Bright Street; W. T. Orton, architect, Civic House, Great Charles Street. Factory premises, Shepcote Street; J. R. Deacon, builders, Lichfield. School, Turves Green, Northfield, for the E.C.; C. Bryant & Sons, Ltd., builders, Whitmore Road, Small Heath.

Bishop Auckland.—Extensions to Town Hall; U.D.C. surveyor.

Blaydon-on-Tyne.—Hospital for the Blaydon, Ryton and Whickham Joint Hospital Board; W. Crooks, architect, 26, Church Street.

Bournemouth.—Houses (20), Wimborne Road; A. C. Barnes. Estate development at Castle Lane; Fox & Sons. Alterations and additions to Odeon cinema, Christchurch Road; Elcock & Co. Development of Boscombe front; hospital, Linford, and extensions to art gallery (£15,000); borough engineer. Extensions to Bolton Percy Hotel, Argyll Road; K. J. J. Marsh.

Bridgwater.—Houses (146), Hamp estate (£51,158); J. Standerwick & Sons, builders, Bridgwater.

Bristol.—Factory, Yatton, for Wake & Dean, Ltd.

Burnley.—Houses and bungalows, Plane Tree estate; J. L. Beckett, borough surveyor.

Caerphilly.—Factory for Welsh Metal Industries, Ltd.

Campbelltown.—Cinema, ballroom and restaurant; George Green, Ltd., cinema proprietors, Glasgow.

Cannock.—Houses (54), Manor Avenue, for S. I. King & Son, 29, Waterloo Street, Birmingham.

Castle Douglas.—Hospital (£30,000); county clerk, Kirkcudbright.

Chadwell Heath.—Houses and flats, Applegarth Drive; W. M. Edwards.

Chester.—Houses (228), Blacon; C. J. Curtis & Co., architects, 11b, Regent Street, London, S.W.1.

Devonshire.—School, Wain Lane, Newton Abbot (£29,893), for the C.C.; director of education, Exeter.

Dunston-on-Tyne.—Factory, for Square Grip Reinforcement Co., North-Eastern Trading estate; Marshall, Tweedy & Bourne, architects, Pilgrim Street, Newcastle-on-Tyne.

Durham.—School, Seaham Harbour, for the C.C.; county architect. Additions to Easington Colliery New Council school (£20,000), for the C.C.; A. V. Clerey & Sons, builders, Frederick Street, Sunderland. Additions to the Alderman Wrauth school, Spennymoor, for the County E.C.; Beadle & Chapman, contractors, Bishop Auckland.

Ealing.—Flats, Perivale Lane and Ruislip Road (£10,855), and flats, Greenford Fire Station (£4,757); borough surveyor.

East Molesey.—Cinema with café, High Street; H. B. Horner, architect, Albemarle Street, London, W.1.

East Retford.—Alterations to offices, Amcott House, Grove Street, Retford, with electrical work; L. Tattersfield, architect, 2, Market Square, Retford.

Ely.—Cinema with shops; Ward & Woolnough, architects, South Brink, Wisbech.

Enfield.—Shops and flats, London Road; Moise, Chain & Clapton.

Epsom.—Houses (62), near Hook Road (£26,107); Perry's (Ealing), Ltd., builders.

Essex.—Schools, Yardley Lane, Chingford, and Upshire, Waltham Abbey, for E.C.; J. Stuart, county architect, County Hall, Chelmsford.

Felling-on-Tyne.—Houses (50) in flats, near Windy Nook Road; Arthur & Kirkup, architects, 13, Swinburne Street, Gateshead-on-Tyne.

Fenton.—Cinema, High Street; Shemilt & Grocott.

Flintshire.—School, Holywell, for the E.C.; R. G. Whitley, county architect, Council Offices, Mold.

Frome.—Cinema, Cork Street, for Albany Ward Theatres, Ltd.

Gateshead-on-Tyne.—Factory for Perga, Ltd.; Stephen Easten, Ltd., contractors, Newcastle-on-Tyne.

Glasgow.—Extensions to Clyde Foundry; Harland & Wolff.

Gorleston-on-Sea.—Houses (55), Beccles Road; W. C. Wright.

Gravesend.—School, Wrotham Road and near Meadow Road, for trustees of King Street Old National School Foundation; J. G. Bennett, borough architect, 5, Woodville Terrace.

Great Barr.—Houses (1,200), Beacon Road; The Handsworth Wood Estates, Ltd., surveyor's office, Hamstead Hall Lodge.

Great Yarmouth.—Houses (144), North Denes estate; borough engineer. Restaurant, St. George's Street; T. C. Read. Extension to factory, St. Nicholas Road; Grout & Co., Ltd. School, North Denes estate, with electrical work, for the E.C.; Olley & Haward, architects, 5, Queen Street.

Guildford.—Printing works, Mill Lane; Salter & Co.

Hanwell.—Six blocks of flats, Woodville Gardens; Great Western Land Co., Ltd., 27, Studland Road, London, W.7.

Harpfields (STAFFORDSHIRE).—Swimming pool, Newcastle High School, Lancaster Road; governors.

Hebburn-on-Tyne.—Cinema, Victoria Road East, for E. J. Hinge; Marshall, Tweedy & Bourn, architects, 129, Pilgrim Street, Newcastle-on-Tyne.

Hucknall.—Houses (90) and bungalows, Ruffs Farm estate; surveyor, Council Offices, Hucknall.

Ilford.—Houses (55), Sydney Road; South Essex Property Co.

Irish Free State.—(LIMERICK).—Houses (152), Janesborough; C. Stenson, city engineer, Town Hall. (WEXFORD).—Town hall; R. Donnelly, architect, 63-64, Upper O'Connell Street, Dublin.

Kingston-on-Thames.—Extensions to Kingston Hospital; A. Saxon Snell & Partners, architects, 9, Bentinck Street, W.1.

Lancaster.—Houses (206), Council estate (£77,265); Nicholson & Wright, Ltd.

Liverpool.—Cinema, Great Crosby; Bradbury & Son, architects, 14, Cook Street.

Llanfyllin.—Houses (19), slum clearance (£8,170); Deane & Co., builders.

London.—(BERMONDSEY).—Tenements, Neckinger estate (£12,840); borough engineer. (HAMMERSMITH).—Tenements (109), Becklow Place; borough engineer. (LEWISHAM).—Premises, Davenport Road, for Royal Arsenal Co-operative Society, Ltd. Extensions to premises, Manor Lane; J. W. Falkner & Son, contractors. (ST. MARYLEBONE).—Shops and flats, Frampton Street; Snell & Co., 47, Maida Vale, W.9. Extensions to Town Hall (£104,192); Stewart & Partners, Ltd., 105, Baker Street, W.1. (ST. PANCRAS).—Refuse destructor; borough engineer. (SHEPHERDS BUSH).—Rebuilding the White City Stadium, Wood Lane, for Greyhound Racing Association; A. Leitch & Partners, architects, 66, Victoria Street, London, S.W.1.

Maidstone.—Baths (£28,000), Square Hill site, Ashford Road; borough surveyor.

Merthyr.—Factory for Worldwin Pistons, Ltd.

Middlesbrough.—Houses (10), Appleton Road; Dean Bros., builders, Marton Road. Houses (10), Croft Avenue, &c.; T. H. Frank, builder, 1, Croft Avenue. Extensions to factory, James Street, for the Middlesbrough Casement Co., Ltd.; Kitching & Co., architects, 21, Albert Road.

Middlesex.—Offices and clinic, Uxbridge (£33,838), for the C.C.; Walker (Tooting), Ltd.

Mirfield.—Cinema, dance hall, café and shops, junction at the Station Road and Easthope; Fairhurst & Poppleton, architects.

Morayshire.—County buildings (£52,000), Elgin, for Moray and Nairn County Council; architect, County Council, Elgin.

Morpeth.—Shops, Stobhill estate; R.D.C. surveyor.

North Shields.—Houses (14), Sunbeam Avenue; A. & E. Brannen, builders, North Shields. Flats (40); Hastie D. Burton, Ltd., builders, King Street.

Northumberland.—School, Tweedmouth, Berwick-on-Tweed, for the E.C.; county architect, County Hall, Newcastle-on-Tyne. School, Alnwick (£20,217), for the County E.C.

Nottinghamshire.—County hall and offices, Trent Bridge, Nottingham, for the C.C.; E. V. Harris, architect, 9, Clifford Street, Bond Street, London, W.1.

Rawtenstall.—Houses (112), Booth estate; borough engineer, Offices, Osborne mill; L. Haworth & Sons, Ltd.

Rotherham.—Fire station and firemen's dwellings (£30,961); Beeden, Ltd., builders, Thryberg.

Rothesay.—Reconstruction work to harbour, new pier offices and waiting rooms (£33,000); burgh surveyor.

Shipley.—Extensions to works, Dockfield; F. Mann, Ltd.

Smethwick.—Houses (46), Manor Road (£20,507); borough engineer.

Southgate.—Shops and flats, Chase Side; Marshall & Tweedy, 96, New Cavendish Street, London, W.1.

South Shields.—Libraries, Tyne Dock and Harton; borough engineer.

Stanmore.—School, Canon's Park estate; North London Collegiate School governors.

Sunderland.—Additions to Commercial Road schools, for the E.C.; education architect.

Swanscombe.—Houses (26), Knockhall estate (£9,100); U.D.C. surveyor.

Swindon.—Houses (18), Church Walk; T. Burrington. Houses (26), near Croft Street; Colborne Estates, Ltd.

Taunton.—Houses (22); S. S. Orchard, R.D.C. surveyor, Mary Street House.

Tottenham.—Houses (42), Scotland Green; borough engineer.

Tynemouth.—Houses (214), Minton Lane estate, and enlargement of isolation hospital (£24,220); borough engineer. Houses (44), in flats, Otterburn Road, for the St. Cuthbert's Estates, Ltd.; J. R. Wallace, architect, 20, Northumberland Square, North Shields. Houses (20), Pineapple estate; H. D. Burton, Ltd.

Wakefield.—Houses (27), Gill Syke estate; Housing and Town Planning department, Town Hall.

Warley.—Cinema (£30,000) at the junction of Birmingham and Wolverhampton Road and Pound Road, for Regal (Oldbury), Ltd.; H. S. Scott, architects, Birmingham.

West Drayton.—Extensions; Compressed Paper Packing Co.

West Hartlepool.—Nurses' home and extensions to Wilson Ward, Cameron Hospital, for Extensions Committee; F. Durkin, architect, Municipal Buildings.

Worsborough.—Council offices (£14,000), Vernon Road; J. Totty, architect, Rotherham.

E.P.E.A.

The Electrical Power Engineers' Association has accepted an invitation to pay an official visit to the E.L.M.A. Lighting Service Bureau, Savoy Hill, London, W.C.2, on Friday, February 18th, at 6 p.m. The invitation is open to all members of the Association and also to members of the London Technical Group. Those wishing to take part in the visit should communicate with the general secretary, 102, St. George's Square, London, S.W.1.